

## The Effects of Promotion and Prevention Cues on Creativity

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This study tested whether cues associated with promotion and prevention regulatory foci influence creativity. The authors predicted that the “risky,” explorative processing style elicited by promotion cues, relative to the risk-averse, perseverant processing style elicited by prevention cues, would facilitate creative thought. These predictions were supported by two experiments in which promotion cues bolstered both creative insight (Experiment 1) and creative generation (Experiment 2) relative to prevention cues. Experiments 3 and 4 provided evidence for the process account of these findings, suggesting that promotion cues, relative to prevention cues, produce a riskier response bias (Experiment 3) and bolster memory search for novel responses (Experiment 4). A final experiment provided evidence that individual differences in regulatory focus influence creative problem solving in a manner analogous to that of incidental promotion and prevention cues.

Over the past several years, psychologists have made considerable progress in understanding the cognitive mechanisms underlying creative thought (see Smith, Ward, & Finke, 1995; Sternberg, 1999). However, the critical question of how motivation may influence creative thought has remained relatively unexplored (but see Amabile, 1996; Hirt, McDonald, & Melton, 1996). Recently, Higgins (1997) has formulated a theoretical framework, regulatory focus theory, which may help elucidate the insufficiently understood link between motivation and creativity. Simply stated, Higgins posits two qualitatively distinct motivational orientations, a *promotion focus*, which entails motivation to attain nurturance (e.g., food), and a *prevention focus*, which entails motivation to attain security (e.g., shelter from harm). With regard to affective pleasure and pain, successful attainment of nurturance-related goals within a promotion focus engenders cheerfulness-related affect, whereas failure within a promotion focus leads to dejection-related affect. In contrast, successful attainment of security-related goals within a prevention focus engenders quiescence-related affect, whereas failure within a prevention focus leads to agitation-related affect (Higgins, Shah, & Friedman, 1997).

Critically, promotion motivation is posited to involve a relatively “risky” processing style in which novel alternatives are eagerly and actively sought, whereas prevention motivation is posited to involve a relatively risk-averse and vigilant processing

style in which repetition is favored over novelty and alternatives are carefully eliminated (Crowe & Higgins, 1997; Liberman, Idson, Camacho, & Higgins, 1999). According to Higgins (1997), the processing style elicited by a promotion focus may enhance creative thought, and that elicited by a prevention focus may undermine creative thought, independent of the effects of emotional experience.

Although not explicitly discussed by Higgins (1997), the latter predictions may be readily understood as involving “cognitive tuning” of processing styles to meet the demands of the environment (Clore, Schwarz, & Conway, 1994). Specifically, activation of a promotion focus, a focus on nurturance, may be seen as signaling that the environment is prospectively benign, thereby leading to adoption of a “riskier,” more explorative processing style and bolstering creativity. Correspondingly, activation of a prevention focus, a focus on security, may be viewed as signaling that the environment is prospectively threatening, thereby leading to the adoption of a more risk-averse, vigilant processing style and impairing creativity. Simply stated, Higgins’s (1997) framework might be seen as offering a “motivational orientation as information” model (cf. Schwarz 1990; Schwarz & Bless, 1991): From this perspective, motivational orientations (i.e., regulatory foci) constitute the primary forces impelling the cognitive tuning of processing styles, with affective experiences providing supplemental information regarding the (in)effectiveness of these processing styles in attaining the nurturance or security-related goal(s) at hand.

Empirically speaking, the results of a recent study by Crowe and Higgins (1997) at least indirectly support the hypothesis that a promotion focus is associated with enhanced creativity relative to a prevention focus (Higgins, 1997). In an initial experiment, Crowe and Higgins manipulated regulatory focus and subsequently administered a sorting task that gauged the ability to generate alternatives. The induction of regulatory focus involved a task-framing manipulation. In the promotion condition, participants were instructed that the quality of their sorting task performance would determine whether or not they were to subsequently

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work on a desirable task. In the prevention condition, participants were instructed that the quality of their performance would determine whether or not they were to subsequently work on an undesirable task. The sorting task simply involved subgrouping exemplars of fruits and vegetables according to freely chosen criteria. As predicted, promotion-focused participants generated more subgroups than those with a prevention focus. Higgins (1997) subsequently interpreted this as indicating greater "abstract thinking" or "creativity" under a promotion focus. Crowe and Higgins (1997, Study 1) also found that participants in a prevention focus were more "concrete" and perseverant in their selection of sorting criteria, generally choosing simpler criteria and repeating these criteria more often across categories. Critically, these findings remained reliable controlling for the effects of transient affect.

In a follow-up experiment, Crowe and Higgins (1997, Study 2) tested whether promotion and prevention motivational orientations indeed give rise to the differentially risk-averse processing styles posited to mediate regulatory-focus effects on creativity (Higgins, 1997). Here, after manipulating regulatory focus by making nurturance or security-related outcomes ostensibly contingent upon performance, Crowe and Higgins (1997) administered a recognition memory signal detection task. In this task, participants were initially presented with a list of words to memorize. After a 20-s filler interval during which they performed an unrelated task, participants were presented with a new list of words, half of which had been studied earlier ("old") and half of which had never been seen before ("new"). Participants were required to decide ("yes" or "no") whether each word was old or new.

Signal detection analyses minimally involve the computation of two descriptive statistics, an index of response bias and an index of discriminative ability or accuracy. Most relevant to the current discussion, response bias scores reflect the individual's threshold for responding "yes," that is, for deciding that a word had been seen earlier (see Galanter, 1988; Tanner & Swets, 1954). Lower thresholds represent a tendency to insure "hits" (successful recognition of a target word) at the cost of increased "false alarms" (failure to reject a distractor word)—this inclination to say "yes" may be seen as indicating a "risky" decisional bias. In corresponding fashion, higher response thresholds represent a tendency to insure "correct rejections" (successfully rejecting a distractor word) at the cost of increased "misses" (failing to recognize a target word). This inclination to say "no" may be seen as indicating a more "conservative" bias (i.e., risk aversion). On the basis of this logic, Crowe and Higgins (1997) hypothesized that individuals with a promotion focus, who are posited to adopt a relatively "risky" processing style, should demonstrate lower response thresholds (i.e., less stringent criteria for saying "yes") than their prevention focused counterparts. Their prediction was strongly supported, providing the first evidence that promotion and prevention regulatory foci differentially influence the processing styles posited to affect "abstract thinking" and creativity (Higgins, 1997).

### The Present Study

Our objectives in the current study were twofold. First, we sought to build on the work of Crowe and Higgins (1997), both by providing more direct and systematic support for the notion that regulatory focus influences creativity and by obtaining additional evidence that this influence may be mediated by the impact of

regulatory focus on processing style. Second, we hoped to expand upon Higgins' (1997) line of reasoning by demonstrating that elicitation of an "active" regulatory focus, in which participants are consciously motivated to attain personal nurturance or security, is unnecessary for producing effects of promotion and prevention on cognitive processing. More specifically, we sought to test whether stimuli that are merely associated with promotion or prevention regulatory foci, yet do not directly elicit the motivation to seek nurturance or security, may themselves substantially influence performance, including creative problem solving.

### *Theoretical Rationale*

What reason is there to believe that cues that are associated with, yet do not actively elicit, regulatory foci may themselves independently activate differential processing styles and thereby influence creative cognition? Although speculative at present, it does seem likely that over the course of a lifetime, the chronic adoption of a "risky," explorative processing style in a promotion focus and the chronic adoption of a risk-averse, vigilant processing style in a prevention focus may lead these styles to become automatically activated when a person is presented with cues that the environment offers nurturance or threatens security. Such a state of affairs would have clear survival value—it would allow the individual to have the processing style "appropriate" for responding to benign or dangerous situations activated before he or she consciously realizes that the current environment is indeed benign or threatening.

Beyond these conceptual speculations, we have recently collected a large body of data that may be interpreted as consistent with the hypothesis that simple regulatory focus cues independently influence creativity. In several experiments, we (Friedman & Förster, 2000, in press) manipulated bodily feedback related to either approaching positive stimuli or avoiding negative stimuli and then examined the effects of this differential internal stimulation on cognitive processes related to creativity. Bodily feedback was manipulated by having participants engage in one of two specific motor actions, either arm flexion, a motor action used to acquire or consume desired objects, or arm extension, a motor action used to reject undesired objects (Cacioppo, Priester, & Berntson, 1993). In brief, these experiments demonstrated that arm flexion, relative to arm extension, bolstered insight problem solving, cognitive flexibility, and the ability to generate creative alternatives. Interestingly, in no given experiment did arm flexion or extension influence mood or emotional state; moreover, all effects of motor actions on creative cognition remained reliable after controlling for the influence of affective states, task enjoyment, and the effortfulness of the motor actions.

Theoretically speaking, it is quite possible that rudimentary bodily stimuli such as arm flexion may be associated with a promotion focus, that is, with the motivation to attain nurturance by approaching beneficial objects. In corresponding fashion, rudimentary bodily stimuli such as arm extension may be associated with a prevention focus, that is, with the motivation to attain security by avoiding noxious stimuli. If so, these internally produced, nonaffective stimuli may generally function as regulatory focus cues, cues that by virtue of their chronic association with promotion and prevention motivational orientations independently trigger the differential processing styles accompanying these orientations.

Unfortunately, although we have amassed a considerable amount of empirical evidence demonstrating the influence of arm flexion and extension on creative cognition (Friedman & Förster, 2000, in press), we have never directly addressed whether these motor actions are indeed differentially associated with promotion and prevention foci. In effect, this leaves open the critical question as to whether regulatory focus based tuning cues may indeed independently influence creativity. To explicitly assess this notion, we decided to “start from scratch,” developing a novel manipulation of promotion and prevention cues and examining the effects of this manipulation on established measures of creativity (Experiments 1 and 2) and on the decision making (Experiment 3) and memory processes (Experiment 4) proposed to underlie creative thought. To glean additional support for a regulatory focus based account, in a final experiment (Experiment 5), we administered an individual-difference measure of chronic promotion and prevention motivation and analyzed its predictive utility with respect to a test of creative insight.

### *Manipulating Promotion and Prevention Cues*

Although to date, studies conducted under the aegis of regulatory focus theory have failed to directly examine the effects of promotion and prevention foci on creativity, several of these studies have experimentally examined the effects of regulatory focus on other domains of performance, including recall memory (Higgins, Shah, & Friedman, 1997) and anagram unscrambling (Shah, Higgins, & Friedman, 1998). As alluded to earlier, regulatory focus was manipulated in these experiments by instructing participants that actual, promotion-related outcomes (e.g., gains and nongains) or prevention-related outcomes (e.g., losses and nonlosses) were contingent on their task performance. To test the hypothesis that such elicitation of an “active” regulatory focus is not required to influence cognitive processing and that simple regulatory focus cues may suffice to affect creative cognition, we developed a novel manipulation of these cues, a manipulation designed to simply and unobtrusively activate the rudimentary semantic and procedural representations associated with striving for nurturance or security.

Specifically, prior to their completing creativity-related measures, we had participants work on an ostensibly separate and unrelated task in which they had to complete a pencil-and-paper maze. Perhaps in unwitting homage to our behaviorist forebears, in both conditions we depicted a cartoon mouse trapped inside the maze and instructed participants to “find the way for the mouse.” In the promotion-cue condition, a piece of Swiss cheese was depicted as lying outside the maze, in front of a brick wall containing an entryway for the mouse. We posited that completion of this version of the maze would activate both the semantic concept of “seeking nurturance” (here, represented by available food) and the procedural representation coding the movement toward the desired end state of nurturance. In the prevention-cue condition, instead of Swiss cheese, an owl was depicted as hovering above the maze, presumably ready to swoop down and capture the mouse unless it could escape the maze and retreat through the aforementioned entryway. Completion of this version of the maze was posited to activate the semantic concept of “seeking security” as well as the procedural representation coding the movement toward the desired end state of safety. Again,

inasmuch as these manipulations were ostensibly incidental to subsequent creativity measures and involved finding the way for a cartoon rodent, they were presumably unlikely to elicit an “active” regulatory focus, in the sense of a motivation to attain personal nurturance or security. As such, we hoped they would provide a fairly strong test of our hypothesis that regulatory focus cues may independently influence creative cognition.

## Experiment 1

### *Method*

#### *Overview*

In this initial experiment, participants completed either the cheese (promotion-cue condition) or owl (prevention-cue condition) versions of the aforementioned maze task. Afterwards, they completed the first half of the Snowy Pictures Test (SPT; Ekstrom, French, Harman, & Dermen, 1976). The SPT involves presenting participants with a series of images of simple objects hidden within complex patterns of visual noise. Participants view these images sequentially, attempting to perceptually disembed and name the obscured objects they contain. This task, which we have previously used to gauge cognitive restructuring (Friedman & Förster, 2000, Experiment 2), may essentially be seen as a test of (visual) insight inasmuch as it meets the three formal characteristics of creative insight problems proposed by Schooler, Ohlsson, and Brooks (1993): (a) (each snowy picture item) is ultimately soluble by the average problem solver; (b) (the attempt to solve any given snowy picture item) is likely to produce an impasse, that is, a state of high uncertainty as to how to proceed, during the course of solution; and (c) (the attempt to disembed any given target object) is likely to produce an “Aha experience,” a state in which impasse is suddenly overcome and the solution is suddenly discovered, after prolonged efforts at solution. Consistent with our earlier discussion, we predicted that the “risky,” explorative processing style triggered by promotion-focus cues (here, the cheese maze), relative to the risk-averse, perseverant processing style triggered by prevention focus cues (here, the owl maze), would enhance the ability to solve these problems.

#### *Participants*

Ninety University of Maryland College Park undergraduates were recruited for a series of “paper-and-pencil surveys.” Participants were run in groups and were given \$5 for participation.

#### *Procedure*

On arrival, participants were given a large packet of paper-and-pencil surveys “from various areas of the Department of Psychology” to complete, all but two of which were entirely unrelated to the experiment at hand. Embedded within this packet was the manipulation of regulatory-focus cues, directly followed by the first 12 items of the SPT. Half the participants were randomly assigned packets containing the promotion (cheese) version of the maze, the other half were assigned the prevention (owl) version. The instructions for the maze and SPT tasks were typed in different fonts to emphasize the purported disconnection between these measures. Participants were allowed to work freely, without time constraints. Experimenters were blind both to condition and to the hypothesis. After completing the survey packet, participants were probed for suspicions, debriefed, paid, and released. No suspicions regarding the connection between the maze task and the SPT were voiced.

### *Results and Discussion*

SPT insight scores were computed by summing the number of embedded images (out of 12) correctly identified. To assess the

experimental hypothesis that promotion focus cues enhance SPT performance relative to prevention-focus cues, we conducted a *t* test comparing the total number of correct solutions offered in the cheese and owl maze conditions. Consistent with predictions, participants in the promotion-cue condition correctly solved significantly more SPT items ( $M = 8.93$ ) than those in the prevention-cue condition ( $M = 8.15$ ),  $t(88) = 2.21$ ,  $p < .03$ . This constitutes the first evidence that semantic and procedural cues associated with a promotion focus, relative to those associated with a prevention focus, may facilitate creativity—in this case, insight problem solving.<sup>1</sup>

Of course, although encouraging, the results of the present study failed to account for several viable alternative explanations. For instance, perhaps the promotion maze differentially improved mood or emotions, thereby engendering enhanced creativity by way of affective influences (Hirt et al., 1996; Isen, 1987).<sup>2</sup> Likewise, the manipulations may have differentially influenced subjective expectancies of success on the SPT, general motivation to succeed at the task, or liking for the task (i.e., intrinsic interest; Amabile, 1996), any or all of which may have bolstered SPT performance. To address these mediational issues and to find strong, converging evidence for the impact of regulatory focus cues on creative cognition, in Experiment 2 we used a very different test of creativity and included measures of mood, emotions, expectancies, and task liking to statistically control for the prospective influences of these factors.

## Experiment 2

### Method

#### Overview

Unlike insight problems, such as those making up the SPT, most of the tasks that have been used in the experimental study of creativity do not have fixed solutions, nor do they typically produce a distinct impasse to be overcome (Schooler et al., 1993). Rather, many of these tasks involve generating instances of pre-existing or artificial categories, which are then content-coded for their “innovation” (e.g., Murray, Sujan, Hirt, & Sujan, 1990; Hirt, Levine, McDonald, Melton, & Martin, 1997; Smith, Ward, & Schumacher, 1993). However, despite these differences, there is good theoretical reason to believe that regulatory-focus cues may exert an influence on creative generation that is analogous to their impact on creative insight. Specifically, the cautious bent associated with prevention focus cues, relative to the explorative bent associated with promotion focus cues, may enhance attentional perseverance on initially generated exemplars, their component features, or other associated cognitive material. This state of affairs may lead to memory blocking, whereas the perseverance on initial exemplars (or related material) inhibits retrieval of innovative novel exemplars (or the material required to formulate them). As a result, in comparison with promotion cues, prevention cues may essentially undermine the production of creative alternatives (cf. Smith, 1995; Smith et al., 1993). Notably, this doesn't imply that prevention cues should diminish overall task output relative to promotion cues—inasmuch as there are infinite acceptable solutions to the generation task, prevention-oriented participants may still be able to fluently generate viable solutions for a brick—a task used in this experiment—even if these solutions are not the most innovative or divergent.

To test the hypothesis that regulatory-focus cues affect creative generation, in Experiment 2 we had participants complete either the cheese or owl maze and subsequently complete a creative generation task previously used by Friedman and Förster (in press, Experiment 2). As alluded to

above, it was predicted that the promotion cue (cheese maze) would produce more creative responses than the prevention cue (owl maze); in addition, this effect was expected to remain statistically reliable after we controlled for the influence of both emotional (e.g., mood) and nonemotional (e.g., task liking) states on creativity.

#### Participants

Forty undergraduates of the University of Würzburg were recruited for a study on “achievement tasks.” Participants were run individually and received a chocolate bar for participation. Six participants did not complete the regulatory focus cue manipulation and were therefore excluded from the analyses.

#### Procedure

On arrival, participants were given a packet of paper-and-pencil surveys and instructed to complete the “different achievement tasks” contained therein. The first of these tasks was the regulatory focus cue manipulation; here, participants were randomly assigned to receive the promotion (cheese maze) or prevention (owl maze) versions. Unlike in Experiment 1, participants were stopped by the experimenter after 2 min had elapsed—all participants in Experiment 1 had completed the maze within this time frame.<sup>3</sup> Immediately afterwards, participants were administered a survey gauging their current affect. Participants were first asked about their mood (“How do you feel right now?”). To provide for a more sensitive measurement, responses were tendered on an analog scale consisting of a line, 9.2 cm long, anchored at *very bad* and *very good*, on which participants were to make a vertical pencil mark indicating their response. Subsequently, participants were asked about how concerned, content, happy, relaxed, nervous, down, disappointed, joyful, calm, tense, depressed, and relieved they currently felt (“How \_\_\_\_\_ do you feel right now?”) on a Likert scale anchored at 1 (*not at all*) and 9 (*extremely*). Afterwards, participants were asked to rate their performance expectancies regarding the next achievement task (“How well will you perform on the next task?”), on a scale anchored at 1 (*very poorly*) and 9 (*very well*), and their prospective liking

<sup>1</sup> It is important to note that in the current experiment (as well as in Experiments 2–4) the absence of a proper control group renders it impossible to ascertain whether the effect at issue is predominantly driven by the promotion condition, the prevention condition, or both. As such, any statements regarding the relative enhancement of creativity by promotion cues may be restated with equal propriety in terms of the relative impairment of creativity by prevention cues. See Experiment 5 for more unambiguous evidence regarding the independent contributions of promotion and prevention foci to creative cognition.

<sup>2</sup> This prospect was considered highly unlikely inasmuch as the relatively potent, personally involving manipulations of regulatory focus used in previous studies did not reliably influence transient affect (Crowe & Higgins, 1997; Higgins et al., 1997; Shah et al., 1998; Förster, Higgins, & Idson, 1998). Consistent with expectations, there were in fact no reliable effects of the regulatory focus cue manipulation on any measure of transient affect in the current study (Experiments 2–5).

<sup>3</sup> These simple mazes were constructed such that they would be solvable by all participants within the allotted time, thereby controlling for ultimate performance outcomes. To insure against systematic variation in task difficulty, we also coded for the number of wrong turns made by participants while completing the mazes. There were a total of only five such wrong turns made by all participants in Experiment 2, Experiment 3, and Experiment 4 combined, arguing against the possibility that any between-subjects differences in creativity were mediated by variations in task difficulty.

for the next task ("How much do you think you will like the next task?"), on a scale anchored at 1 (*not at all*) and 9 (*very much*).

On completion of this survey, participants were instructed to generate and write down, on a preprepared blank sheet of paper, as many creative uses for a brick as they could think of. They were asked to refrain from listing typical uses or from listing uses that were virtually impossible. Participants were interrupted after 1 min and told to stop generating uses and to fill out a final questionnaire. This survey gauged participants' retrospective liking of the creativity task ("How much did you like the task?"), on a scale anchored at 1 (*not at all*) and 9 (*very much*), their motivation to perform the task ("How motivated were you to do the task?"), on a scale anchored at 1 (*not at all*) and 9 (*very much*), and the perceived difficulty of the task ("How difficult was the task?"), on a scale anchored at 1 (*not at all difficult*) and 9 (*very difficult*). As a manipulation check, we then asked participants to describe the pictures on the maze task that they had completed earlier. All participants accurately recalled the content of the maze drawings (e.g., a mouse seeking a piece of cheese in the promotion-cue condition), signifying that they had indeed processed the nurturance- or security-related cues. Finally, participants were probed for suspicions, debriefed, sworn to secrecy, given a chocolate bar, and released. No suspicions regarding the connection between the maze task and the creative generation task were voiced.

The main dependent variable was the creativity of the brick uses generated by participants. To get an objective assessment, we asked 12 independent scorers (all members of the Psychology Department at the University of Würzburg) to rate the creativity of the 117 different uses participants generated on a Likert scale ("How creative is this response?") anchored at 1 (*very uncreative*) and 9 (*very creative*), with an explicit midpoint of 5 (*neither creative nor uncreative*). These ratings were used to compute a mean creativity score for each participant (summed ratings for each response offered, divided by the total number of responses). Additionally, a measure of the total number of creative responses was computed by summing the number of responses that exceeded the midpoint (5) of the creativity scale. An example of a creative solution was "to crush it and use it to draw pictures on the sidewalk"; an example of an uncreative solution was "to build a house with it."

### Results and Discussion

Prior to analyzing creativity scores, we examined the between-groups difference in total number of responses tendered. Cue (promotion [cheese] vs. prevention [owl]) did not reliably affect the total number of brick uses listed by participants,  $M_{\text{Promotion}} = 5.12$ ,  $M_{\text{Prevention}} = 5.23$ ,  $t < 1$ , suggesting that promotion and prevention cues do not differentially affect the sheer volume of production on this task. To assess the primary experimental hypothesis that completion of the cheese maze would enhance creative generation relative to completion of the owl maze, we conducted a  $t$  test comparing mean creativity scores within the two regulatory-focus conditions. As predicted, participants who completed the cheese maze prior to the generation task demonstrated more creativity ( $M = 4.94$ ) than those who completed the owl maze ( $M = 4.48$ ).  $t(32) = 3.10$ ,  $p = .004$ . Correspondingly, a  $t$  test substituting total number of creative responses as the dependent measure revealed that completion of the cheese maze led to generation of a higher number of creative uses for a brick ( $M = 2.59$ ), than did completion of the owl maze ( $M = 1.76$ ),  $t(32) = 2.02$ ,  $p = .05$ . These results support the hypothesis that nonaffective cues associated with a promotion focus (i.e., nurturance motivation), relative to those associated with a prevention focus (i.e., security motivation) trigger a processing style that enhances the ability or proclivity to generate creative alternatives.

A series of additional analyses was conducted to address issues of mediation that remained from Experiment 1. First, several  $t$  tests were conducted separately using pretask expectancies, pre- and posttask task liking judgments, changes in liking (posttask – pretask ratings), posttask difficulty and motivation ratings, and mood scores as dependent measures. (Mood scores were coded by dividing the analog response line into 28-segments of equal length and recording the segment within which the participant's marking fell.) In addition, a positive affect composite score was computed from the summed ratings of positive affective states (content, happy, relaxed, joyful, calm, and relieved) and a negative affect composite score was computed from the summed ratings of negative affective states (concerned, nervous, down, disappointed, tense, and depressed) to form two additional dependent measures. Simply stated,  $t$  tests revealed no reliable effects of cue (promotion vs. prevention) on any of the above measures,  $ts < 1$ .

In addition to these simple  $t$  tests, a series of supplementary multiple regression analyses was conducted using total number of creative responses as a dependent variable, using cue as an independent variable, and separately entering all remaining measures as covariates. The main effect of cue (with promotion bolstering creativity relative to prevention) remained reliable in every case. This supports the hypothesis that the influence of promotion and prevention cues on creativity is independent of the effects of emotional states, task expectancies, and judgments of task difficulty. Interestingly, although these variables apparently did not mediate the main effect of cue, three of them yielded reliable, independent effects on creative generation in their own right. First, there were unpredicted, positive main effects of both posttask ratings of liking for the creativity task,  $b = 0.19$ ,  $F(1, 31) = 6.81$ ,  $p < .02$ , and change in liking for the task (posttask – pretask ratings),  $b = 0.33$ ,  $F(1, 31) = 3.96$ ,  $p = .05$ . Inasmuch as cue did not significantly predict variation in either of these liking measures (see above), these findings are consistent with the notion that task liking mediates the relationship between regulatory focus cues and creativity (see Kenny, Kashy, & Bolger, 1998); however, these results are in line with Amabile's (1983, 1996) proposal of a positive association between "intrinsic motivation" (e.g., task enjoyment or liking) and creativity. Regression analyses also revealed a main effect of transient negative affect,  $b = -0.11$ ,  $F(1, 31) = 4.80$ ,  $p < .04$ , which, consistent with previous work (e.g., Hirt et al., 1997; Isen, 1987), suggests that negatively toned emotional states impair creative thought.

In sum, Experiment 2 provides converging evidence for the hypothesis that cues associated with distinct regulatory foci independently influence creativity, in this case, the generation of novel alternatives. Completion of the owl maze, a semantic and procedural prevention focus cue, relative to completion of the cheese maze, an analogous promotion focus cue, impaired the ability or proclivity to generate creative ways of using a brick. Theoretically speaking, this result is supportive of the notion that prevention cues trigger a more risk-averse, perseverant processing style than do promotion cues. In the present experiment, the elicitation of these distinct processing styles may have led participants who completed the prevention-cueing owl maze, relative to those who completed the promotion-cueing cheese maze, to persevere on initially retrieved exemplars or associated material, thereby objectively diminishing their propensity to innovate. Critically, as predicted, the impact of promotion and prevention motivational cues

on creative generation was statistically independent of the effects of affective states, performance expectancies, and task enjoyment.

### Experiment 3

#### Method

##### Overview

Once we had found evidence that regulatory focus cues influence both creative insight and creative generation, we decided to more closely examine the processes hypothesized to mediate these effects. In our current process model, perhaps the most pivotal single tenet is the notion that promotion cues elicit a less risk-averse processing style than do prevention cues. Generating direct empirical support for this fundamental difference was therefore a matter of considerable priority.

To generate this support, in Experiment 3 we conceptually replicated Crowe and Higgins's (1997, Study 2) procedure so as to demonstrate that simple regulatory focus cues—cues that merely activate semantic and procedural representations associated with the motivation to attain nurturance or security—may independently influence response bias (i.e., risk aversion). To reiterate, in Crowe and Higgins' (1997) design, participants were actively driven to pursue nurturance- or security-related outcomes that were ostensibly contingent upon their recognition memory performance. In place of this "active" manipulation of promotion and prevention motivation, we decided to substitute the incidental manipulation of regulatory focus cues used in Experiments 1 and 2.

In addition to pursuing this main empirical objective, we also modified Crowe and Higgins's (1997) basic paradigm to explore whether regulatory focus yields different effects on response bias when activated at encoding versus at recognition. Crowe and Higgins's (1997) original design precluded a clear examination of the role of the locus (pre-encoding vs. pre-recognition) of regulatory focus elicitation for three reasons. First, and most importantly, Crowe and Higgins (1997) always administered their regulatory-focus manipulation prior to encoding. Second, these authors interspersed a mere 20-s filler interval between encoding and recognition, potentially allowing the effects of regulatory focus activation at encoding to carry over to the recognition phase. Finally, even if Crowe and Higgins (1997) had allotted additional filler time, their instruction to participants that nurturance- or security-related outcomes were contingent upon recognition accuracy likely maintained activation of promotion or prevention concerns well into the recognition period.

In the present experiment, we attempted to rectify these "shortcomings" by varying the locus of activation of regulatory focus cues between subjects, by allotting an entire hour of filler time between encoding and recognition, and by using a manipulation (cheese vs. owl maze) that was brief and incidental to the signal detection task, and thereby less likely to endure in salience over the course of the procedure. With respect to this full design, we predicted that the manipulation of regulatory focus cues immediately prior to recognition would trigger the adoption of differential processing styles, leading participants in the promotion cue condition (cheese maze) to demonstrate a riskier (less conservative) response bias than those in the prevention-cue condition (owl maze). In contrast, when manipulated before encoding, regulatory focus cues were expected to dissipate in activation level prior to the recognition phase; therefore, they were not predicted to affect response biases, which presumably operate at this phase alone.<sup>4</sup>

##### Participants

Forty undergraduates of the University of Würzburg were recruited for a battery of experiments on "evaluations, concentration, and memory." Participants were run in groups and received 12 DM for participation (at the time, approximately \$6).

##### Procedure

On arrival, participants were randomly assigned to receive either the promotion- or prevention-cue manipulation either prior to encoding or prior to recognition. Those slated to receive the manipulation prior to encoding were immediately administered the cheese or owl maze task to work on and were stopped within 2 min. Afterwards, they completed the encoding phase of a recognition memory task; specifically, they were given 2 min to memorize a list of 53 highly frequent, evaluatively neutral German words selected from the corpus of Strack and Förster (1995). Participants in this pre-encoding-activation condition subsequently worked on a series of unrelated filler tasks for approximately 1 hr, after which they completed the recognition phase of the memory task. Here, participants were presented with 106 frequent words, including 53 targets, items that had been presented during the encoding phase, and 53 distractors, items that had not been presented earlier—participants were asked to indicate whether or not they had seen each item during the first phase. For participants slated to receive the regulatory focus cue manipulation prior to recognition, the cheese or owl maze task was administered following the completion of both the encoding and filler tasks and immediately preceding the yes/no recognition trial. After the recognition phase, participants in all conditions were administered a survey asking them about their current mood ("How do you feel right now?") on a Likert scale anchored at 1 (*very bad*) and 9 (*very good*), the subjective difficulty of the recognition memory task ("How difficult was the task?"), on a scale anchored at 1 (*not at all difficult*) and 9 (*very difficult*), and their liking of the task ("How much did you like the task?"), on a scale anchored at 1 (*not at all*) and 9 (*very much*). Finally, participants were probed for suspicions, debriefed, paid, and released. No suspicions regarding the connection between the maze task and the recognition memory task were voiced.

*Data coding.* To calculate response bias and discriminability (accuracy), we followed the recommendations of Snodgrass and Corwin (1988) for computing these measures given relatively small numbers of observations ( $N < 150$ ). Specifically,  $Br$  ( $p[\text{false alarms}]/[1 - p[\text{hits}] + p[\text{false alarms}]$ ) was calculated to describe response bias (with higher scores indicating a less stringent threshold, that is, a riskier bias) and  $Pr$  ( $p[\text{hits}] - p[\text{false alarms}]$ ) was calculated to describe discriminability (with higher scores indicating greater accuracy).

#### Results and Discussion

To test the main experimental hypothesis that promotion cues would lead to a riskier decisional bias than prevention cues when elicited prior to recognition, we conducted a Cue (promotion vs. prevention)  $\times$  Locus (pre-encoding vs. pre-retrieval) analysis of variance (ANOVA) on response bias scores ( $Br$ ). Consistent with predictions, this analysis revealed a main effect of cue,  $F(1, 36) = 5.61, p < .03$ , entirely qualified by the expected two-way Cue  $\times$  Locus interaction,  $F(1, 36) = 4.14, p < .05$ . As inspection of Figure 1 confirms, this suggests that when completed

<sup>4</sup> Response biases should only come into play at the recognition phase because it is at this point that recollective experiences must be actively disambiguated. After a lengthy filler interval, inability to retrieve a given item may be attributed to many sources, including the possibility that it had never been presented and the possibility that it had been presented but forgotten (Strack & Förster, 1998). At this juncture, the risky processing style elicited by promotion cues is posited to increase the likelihood of accepting an unretrieved item as having been initially presented (giving rise to more "hits" as well as more "false alarms"), whereas the risk-averse processing style elicited by prevention cues is posited to increase the likelihood of rejecting an unretrieved item as unrepresented (giving rise to more "correct rejections" as well as more "misses").

prior to recognition, the promotion-cueing cheese maze, relative to the prevention-cueing owl maze, gave rise to higher *Br* scores, indicating a riskier response tendency in the promotion condition. As predicted, there was no difference in *Br* between promotion and prevention conditions when the regulatory-focus cueing manipulation was administered prior to encoding. These findings provide converging support for Crowe and Higgins's (1997) proposal that a promotion focus leads to a "riskier" processing style than a prevention focus, and additionally suggests that mere semantic and procedural cues associated with "active" regulatory foci are sufficient to trigger these distinct processing styles. Furthermore, the present findings lend additional clarity to Crowe and Higgins (1997) results, suggesting that the effect of regulatory focus on response bias is driven by its influence at time of recognition rather than time of encoding.

As discussed earlier, no predictions were made regarding the effects of regulatory focus cues on recognition accuracy, and a Cue  $\times$  Locus ANOVA revealed no remotely reliable effects on *Pr*. Theoretically speaking, the absence of regulatory focus cueing effects here should not be taken as indicating that promotion or prevention do not influence processes associated with recognition memory. For instance, it is possible that promotion and prevention cues both bolster recognition equally, if perhaps for different reasons—conjecturally speaking, during encoding, the "riskier," more explorative style associated with promotion might lead to activation of more (or more divergent) associates to the target words, providing for a richer set of retrieval cues during subsequent recognition. Equally speculative is the possibility that the more risk-averse, perseverant style associated with prevention motivation might lead to increased rehearsal time or concentration during encoding. The present task may simply not allow for the detection of these phenotypically similar, but genotypically rather distinct, effects. Exploring this possibility may be a worthy objective for future research.

A series of supplementary analyses was conducted to address whether the effect of regulatory focus cues on "riskiness" was independent of the effects of mood, task liking, and perceived task

difficulty. First, a series of ANOVAs on *Br* was performed, separately including posttask measures of mood, task liking, and difficulty as auxiliary predictors. These analyses revealed the comparatively facilitative effect of promotion cueing within the recognition phase alone and no other reliable effects. A final series of ANOVAs using the three posttask measures as dependent variables and cue and locus as interactive predictors also revealed no reliable effects of experimental condition on mood, task liking, or task difficulty, again supporting the notion that promotion and prevention cues differentially affect the processing styles theoretically posited to influence creative cognition.

## Experiment 4

### Method

#### Overview

Outside of the basic proposition that promotion focus cues trigger a "riskier" processing style than do prevention cues, another proposal we have made regarding mediation is that the style elicited by promotion cues enhances creativity by facilitating memory search for novel responses and/or strategies. Moreover, we have posited that the mechanism driving this differential influence on memory search may involve retrieval blocking, specifically, an attentional perseverance on initial responses (or related material) that impairs access to novel responses (Anderson & Neely, 1996; Roediger & Neely, 1982; Smith, 1995). Inasmuch as the "risky" explorative processing style triggered by promotion cues relative to the risk-averse, cautious processing style triggered by prevention cues reduces perseverance on initially accessed material, promotion cues should produce less blocking of novel responses by this material than prevention cues do. If so, promotion cues may not generally enhance memory search (e.g., by extending the range of spreading activation; cf. Ohlsson, 1992), but instead, may merely enhance search under circumstances in which potentially interfering material is initially retrieved.

To test this hypothesis, in the current experiment, we administered the cheese or owl mazes to participants and then subsequently administered a word-fragment completion task explicitly designed to require searching memory for viable solutions. Critically, this task was designed to activate information in an initial memory search that might serve to block retrieval of novel responses on a subsequent search. In line with our retrieval blocking hypothesis, it was predicted that relative to prevention cueing, promotion cueing would bolster retrieval of verbal solutions from memory, but only on the second memory search, that following the presumed activation of obstructive material. Such a finding would at least indirectly support the notion that promotion cues, relative to prevention cues, may bolster creativity by dint of their mitigating impact on blocking of novel responses.

#### Participants

Thirty-two undergraduates of the University of Würzburg were recruited for a study on "achievement tests for children." Participants were run individually and received a chocolate bar for participation.

#### Procedure

On arrival, participants were given a packet of paper-and-pencil surveys ostensibly containing a number of different achievement tasks. The first of these tasks was the regulatory focus cue manipulation; here, participants were randomly assigned to receive the promotion (cheese maze) or prevention (owl maze) versions. Participants were timed by stopwatch and

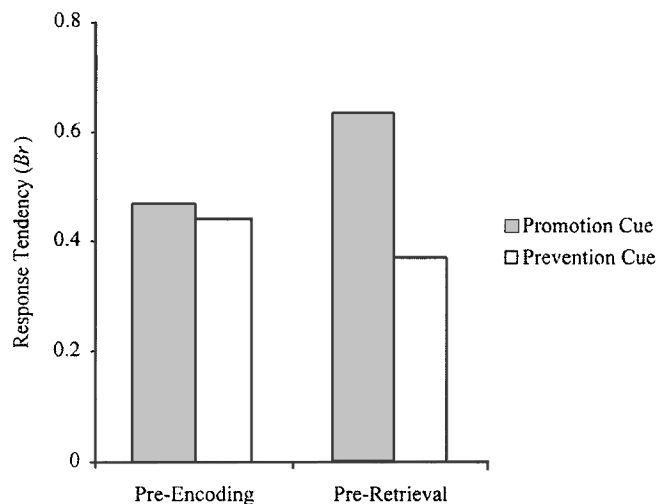


Figure 1. Mean response tendency (*Br*) as a function of cue and locus.



stopped by the experimenter after 3 min had elapsed—all participants had completed the maze within this time frame. Immediately afterwards, participants were administered a survey gauging their current affect. Participants were first asked about their mood (“How do you feel right now?”) on the same analog line scale used in Experiment 2. Afterwards, participants were asked about how happy, concerned, disappointed, calm, content, tense, discouraged, relaxed, down, depressed, relieved, cheerful, and nervous, they currently felt (“How \_\_\_\_ do you feel right now?”), on a Likert scale anchored at 1 (*not at all*) and 9 (*extremely*).

Next, participants performed the word-fragment completion task. This task was composed of 15 word fragments printed twice, once in one column and again in a second column. As their appellation connotes, each word fragment contained blank spaces to which missing letters could be added to form (German) words. For instance, the fifth row was “FL\_CH FL\_CH,” which could be completed with *flach* (shallow) and *Fluch* (curse). Participants were instructed to try to solve as many rows of word fragments as possible within 30 s and were reminded that all the fragments had multiple solutions. This task was designed with the assumption that words initially accessed to complete the first column of word fragments (as well as semantic associates of these words), may receive differential attention, thereby giving rise to more or less interference with the retrieval of novel solutions for the second column of word fragments. To illustrate, after its use as a solution for “FL\_CH”, perseverant attention to and retrieval of *flach* (shallow) when “FL\_CH” is retested may block recall of *Fluch*. Furthermore, perseverance on *flach* (shallow) may prime mental representations of *depth* or *water*, impairing access to the semantic sub-network related to *Fluch* (curse) and thereby preventing retrieval of this other solution (cf. Smith, 1995). On the basis of this reasoning, we concluded that completing more word fragments in the second column alone would indicate improved ability to escape the inhibiting “pull” of material rendered accessible during completion of the word fragments in the first column. If performance was improved on both the first and second columns of word fragments, this would instead suggest a more general enhancement of memory search, as opposed to diminished retrieval blocking.

Following the word-fragment completion task, participants were administered a final survey asking them to rate their enjoyment of the task (“How much did you enjoy the task?”), on a scale anchored at 1 (*not at all*) and 9 (*very much*), their liking for the task (“How much did you like the task?”), on a scale anchored at 1 (*not at all*) and 9 (*very much*), and the subjective difficulty of the task (“How difficult was the task?”), on a scale anchored at 1 (*not at all difficult*) and 9 (*very difficult*). After filling out this posttask survey, participants were probed for suspicions, debriefed, given a chocolate bar, and released. No suspicions regarding the connection between the maze task and the word-fragment completion task were voiced.

### Results and Discussion

It was predicted that participants in the promotion-cue condition (cheese maze) would complete more word fragments in the second column (out of 15) than those in the prevention-cue condition (owl maze) would, suggesting that relative to prevention cues, promotion cues facilitate memory search by diminishing retrieval blocking. Again, no difference between conditions was expected for the first column of word fragments inasmuch as their completion was not preceded by activation of material that could serve to obstruct retrieval. To test this prediction, we subjected the total number of correct word-fragment completions for each column to separate *t* tests (cue: promotion vs. prevention). As predicted, for the first column of word fragments alone, performance did not differ reliably as a function of cue,  $t < 1$ ; however, for the second column, performance differed in the expected direction with the promotion

cue ( $M = 5.13$ ) leading to significantly more solutions than the prevention cue ( $M = 3.06$ ),  $t(30) = 3.75$ ,  $p < .0001$ .

To further assess the hypothesis that promotion cues facilitate memory search by mitigating retrieval blocking, we additionally analyzed zero-order correlations between performance on the first and second columns of word fragments within each cue condition. Holding all else aside, a positive correlation might be expected between performance on the first and second columns of word fragments because of individual differences in ability (e.g., vocabulary) and/or because of priming by either the target fragment (e.g., “FL\_CH”) or by first-column completions of orthographically similar words that can be used to complete second-column fragments (e.g., *Fluch* might prime *flach*). However, this correlation should be reduced in magnitude by retrieval blocking engendered by perseverance on first-column completions and/or related material—ironically, the more solutions that are found for the first column, the more material is activated that can block retrieval of different solutions for the second column. Following this logic, if promotion cues indeed decrease perseverance (on initial responses), there should be a stronger positive correlation between first- and second-column word-fragment completion performance within the promotion-cue (cheese maze) condition than in the prevention-cue (owl maze) condition. These predictions were strongly borne out: within the promotion-cue condition, the correlation at issue was robustly positive ( $r = .561$ ,  $p < .03$ ), whereas within the prevention-cue condition it was, in fact, just as robustly negative ( $r = -.560$ ,  $p < .03$ ).

A series of supplementary analyses was conducted to address whether the effect of regulatory focus cues on word-fragment completion was independent of the effects of mood and emotional states, task enjoyment and liking, and perceived task difficulty. First, we conducted a series of ANOVAs using total number of second-column word-fragment completions as a dependent variable and separately entering mood, specific emotion ratings, task enjoyment, liking, and difficulty as covariates. In all analyses, the predicted main effect of cue remained equally reliable, and no other effects emerged,  $t_s < 1.6$ . Another series of ANOVAs using each of the aforementioned covariates as dependent variables and cue as a predictor also revealed no effects of experimental condition,  $t_s < 1.3$ . These results converge to suggest that promotion and prevention cues independently affected performance on the word-fragment completion task.

In summary, Experiment 4 provides the first direct evidence that regulatory focus cues affect the memory-search processes posited to influence creative cognition (Schooler & Melcher, 1995). Completion of the cheese maze, a manipulation of promotion cues, enhanced retrieval of verbal solutions on a word-fragment completion task, relative to completion of the owl maze, a manipulation of prevention cues. The findings were also consistent with predictions regarding the role of retrieval blocking in producing regulatory focus-based differences in memory search—the “risky,” explorative processing style triggered by promotion cues apparently bolstered memory search for novel fragment completions by diminishing perseverance on obstructive, initially activated cognitive material. Finally, as predicted, the effects of regulatory focus cues on memory search were independent of the impact of both emotional (e.g., mood) and nonemotional states (e.g., task enjoyment).



## Experiment 5

### Method

#### Overview

In the first four experiments, we examined the effects of incidental regulatory focus cues on creativity (Experiments 1 and 2) and on the fundamental cognitive processes posited to mediate the relationship between these cues and creative thought (Experiments 3 and 4). For our final experiment, we took a somewhat different tack, exploring the issue of individual differences: If rudimentary cues associated with promotion and prevention motivational orientations significantly influence creative cognition, then it seems only natural that chronic concerns with promotion or prevention should affect creativity in an analogous fashion. Are individuals with stronger promotion concerns better at creative problem solving than those with stronger prevention concerns? To address this question, we administered a measure of individual differences in the magnitude of ongoing promotion and prevention concerns and subsequently gauged its predictive utility with regard to performance on a test of creative insight.

#### Participants

Thirty-eight undergraduates of the University of Würzburg were recruited as participants for a battery of different psychological studies. Participants were run individually and were paid 2 DM (approximately \$0.90 at the time) for participation. One participant was excluded from the analyses for failing to complete the materials.

#### Materials

**Regulatory focus.** To gauge individual differences in promotion and prevention concerns, we used a measure developed by Higgins et al. (1997). Building on the conception that goal strength is reflected in goal accessibility (cf. Clore, 1994; Frijda, 1996), this computerized “strength-of-guide” measure records the amount of time it takes participants to enter a set of three promotion goals (i.e., ideals: hopes or aspirations, posited to represent nurturance concerns) and a set of three prevention goals (i.e., oughts: duties or obligations, posited to represent security concerns). Faster entry times reflect increased accessibility (see Fazio, 1986) and thereby increased strength of concern—theoretically speaking, increased accessibility of promotion or prevention goals is a product of increased rumination concerning these goals, which is itself a function of their importance. Data coding (see Higgins et al., 1997) results in an index of promotion strength, indicating the importance of promotion concerns, and an index of prevention strength, indicating the importance of prevention concerns. For ease of interpretation, in the analyses to follow, we reverse scored these indexes such that higher scores reflect increased strength of guide (i.e., faster response times).

**Creative insight.** To assess creative insight, we administered the first 10 items of the Gestalt Completion Test (GCT; Ekstrom, French, Harman, & Dermen, 1976; see Friedman & Förster, 2000a, Experiments 3 and 4). In this task, participants view a series of fragmented pictures of familiar objects and attempt to perceptually integrate and recognize them, that is, to “close” each “gestalt.” This task may be seen as requiring (visual) insight inasmuch as each item is ultimately soluble by the average problem solver and is likely to produce an impasse that may be suddenly overcome after continued efforts at solution (see Schooler et al., 1993). In the present experiment, the GCT items were printed on two 8.5-in × 11-in (20.32 cm × 27.94 cm) sheets of paper that were laid flat on a countertop.

#### Procedure

On arrival, participants were individually seated at computers where they completed the strength-of-guide measure. Afterwards, participants

completed a number of paper-and-pencil measures unrelated to the present study. Participants subsequently completed a measure of current affect, asking them how happy, tense, discouraged, calm, content, disappointed, relaxed, cheerful, worried, depressed, and relieved they currently felt (“How \_\_\_\_ do you feel right now?”), on a scale anchored at 1 (*not at all*) and 9 (*extremely*). Finally, they were administered the first 10 items of the GCT. After completing these items, participants were debriefed, paid, and released.

### Results and Discussion

We hypothesized that increased promotion strength of guide would predict increased GCT performance, suggesting that stronger chronic concerns with promotion goals enhance creative insight. In corresponding fashion, we hypothesized that increased prevention strength of guide would predict decreased GCT performance, suggesting that stronger chronic concerns with prevention goals impair creative insight. To assess these hypotheses, we conducted a multiple regression analysis using total number of GCT solutions (out of 10) as a dependent variable and simultaneously entering indexes of promotion and prevention strength of guide as predictors. In line with predictions, this analysis revealed a highly reliable positive main effect of promotion strength on total GCT solutions,  $b = 0.27$ ,  $F(1, 34) = 10.96$ ,  $p < .003$ , suggesting that as the magnitude of chronic promotion concerns increases, so does insight problem-solving performance. This analysis also revealed an independent, negative main effect of prevention strength on total GCT solutions,  $b = -0.49$ ,  $F(1, 34) = 9.73$ ,  $p < .004$ , suggesting that as the magnitude of chronic prevention concerns increases, insight problem solving is correspondingly diminished.

Subsequent multiple regression analyses were conducted separately using a positive affect composite score computed from the summed ratings of positive affective states (content, happy, cheerful, calm, relaxed, and relieved) and a negative affect composite score computed from the summed ratings of negative affective states (discouraged, worried, disappointed, tense, and depressed) as statistical covariates. In these analyses, the main effects of promotion and prevention strength of guide remained equally reliable; furthermore, there were no reliable effects of transient positive or negative affect on insight.

In conclusion, the results of Experiment 5 provide the first empirical evidence that individual differences in promotion and prevention concerns differentially influence creative cognition. Promotion strength of guide, a measure of the magnitude of chronic promotion concerns, was positively predictive of performance on an insight problem-solving task, whereas prevention strength of guide, a measure of the magnitude of chronic prevention concerns, was negatively predictive of insight performance. These effects were independent of the influence of transient affect. Theoretically speaking, these findings may suggest that, over time, an increased concern with promotion (i.e., nurturance-related outcomes) chronically renders the “risky,” explorative processing style associated with promotion motivation more accessible, increasing the likelihood that it will be (beneficially) applied to a given creativity task. Likewise, these findings may suggest that an increased ongoing concern with prevention (i.e., security-related outcomes) chronically renders the risk-averse, perseverant processing style triggered by a prevention focus more accessible, improving the odds that it will be (detrimentally) applied to a given creativity task (cf. Higgins, 1996, 1997). In sum, the results of

Experiment 5 provide converging support for the findings of the first four experiments and, more generally, for the notion that regulatory foci (and the cues associated with them) elicit distinct processing strategies that differentially affect creative cognition.

### General Discussion

In this study, we tested whether promotion and prevention cues influence creativity. In Experiments 1 and 2, participants completed an incidental task (the cheese or owl maze) that activated semantic and procedural representations associated with either a promotion or a prevention focus, and subsequently completed measures of creative insight (Experiment 1) or creative generation (Experiment 2). It was predicted that the “riskier,” more explorative processing style triggered by promotion cues, compared with the more risk-averse, perseverant processing style elicited by prevention cues, would enhance performance on both tasks, supporting our cognitive-tuning framework. These predictions were supported—completion of the promotion-cueing cheese maze, relative to completion of the prevention-cueing owl maze, facilitated performance on a visual insight task (Experiment 1) and enhanced the ability to generate creative uses for a brick (Experiment 2).

In Experiments 3 and 4, we sought preliminary evidence for our process account of these effects. In Experiment 3, promotion cueing (via cheese-maze completion), relative to prevention cueing (via owl-maze completion), engendered an objectively riskier response tendency on a recognition-memory based signal detection task, suggesting that compared with prevention cues, promotion cues may indeed facilitate creativity by virtue of the more “adventurous” processing style they elicit. Experiment 4 provided evidence that is at least indirectly supportive of our hypothesis that regulatory focus effects on creativity are partly mediated by differentially effective memory search (see also Schooler & Melcher, 1995). Here, relative to prevention cueing, promotion cueing improved the ability to retrieve from memory verbal solutions to a series of word fragments. Moreover, inasmuch as promotion cues only differentially facilitated retrieval following the activation of potentially obstructive initial material, the results of this experiment also were consistent with the notion that promotion cues, relative to prevention cues, enhance memory search by diminishing retrieval blocking (cf. Friedman & Förster, in press).

In a final experiment (Experiment 5), individual differences in promotion and prevention motivation were measured and their predictive utility with respect to a test of creative insight was subsequently assessed. Here, stronger chronic promotion concerns, theoretically associated with an increased chronic tendency to use a “risky,” explorative processing style, predicted improved performance on a visual insight task. In contrast, stronger chronic prevention concerns, theoretically associated with an increased chronic tendency to use a risk-averse, perseverant processing style, predicted decreased insight performance. These findings constitute the first evidence to date suggesting that individual differences in regulatory focus may significantly influence creative problem solving and provide converging evidence for the general proposal that regulatory foci (and the semantic and procedural cues associated with them) differentially affect creative cognition. With respect to the four preceding experiments, which lacked proper control conditions, Experiment 5 was also critical inasmuch as it

demonstrated that both promotion and prevention motivations uniquely influence creative thought, albeit in opposite directions.

### *Mood, Emotions, and Task Enjoyment*

Throughout the study, we took steps to ensure that the effects of regulatory focus cues on creative cognition were independent of the influence of transient affective states and task enjoyment. As discussed earlier, there is a great deal of evidence that positive mood and emotional states facilitate creativity and/or that negative mood and emotional states undermine creativity (e.g., Hirt et al., 1996; Isen, 1987). Therefore, it is critical to control for the effects of affective experience when assessing the influence of (purportedly nonaffective) regulatory focus cues on creative cognition. To do so, in Experiments 2 through 5 we gauged levels of current mood and/or specific emotional states before and/or after completion of every dependent measure. Simply stated, in no analysis did the inclusion of any measure of affect, or change in affect, as an auxiliary predictor decrease the reliability of the effects of regulatory focus cues. Supplementary analyses assessing the impact of transient mood and emotional states on creativity (and its component processes) revealed only one reliable effect, found in Experiment 2: Increased levels of current negative affect predicted impaired ability to generate creative uses for a brick. Again, this independent effect provides additional support for the notion that negative affective states impair creativity (e.g., Schwarz & Bless, 1991). It is important to note that the current findings, documenting unique effects of nonaffective, regulatory focus cues on creative cognition, by no means demonstrate that such cues mediate or even supersede affective influences on creativity; rather, they merely suggest that regulatory focus cues may yield an analogous, albeit independent influence on creative thought.

Another potential alternative explanation for the effects of regulatory-focus cues on creative cognition is that promotion cues produce greater task liking or enjoyment than do prevention cues, and that this enhanced enjoyment, not a “looser” processing style (Fiedler, 1988), bolsters creativity. As discussed earlier, the notion that enjoyment (i.e., intrinsic motivation) facilitates creativity has been proposed by Amabile (1983, 1996). To assess this possibility, in Experiments 2 through 4 we had participants rate how much they thought they would like each experimental task (prior to performance, but subsequent to the regulatory focus cue manipulation) and/or how much they in fact liked each task (subsequent to performance). As in the case of mood and emotions, the inclusion of task liking or change in liking as statistical covariates did not diminish the effects of promotion and prevention cues on creative problem solving and its associated processes. However, consistent with Amabile’s (1983, 1996) general hypothesis, in Experiment 2, supplementary analyses revealed that posttask ratings of task liking, as well as ratings of change in liking, positively predicted creative-generation performance. Inasmuch as there was no evidence that regulatory focus cues differentially affected task enjoyment, the latter finding only serves to emphasize that there are undoubtedly multiple, and perhaps multiple independent factors, that influence creative cognition (see Smith, Ward, & Finke, 1995).

### *Regulatory Focus and Hedonic Epiphenomenalism*

The five experiments comprising the current study offered converging evidence for the hypothesis that regulatory foci, either incidentally cued or chronically activated, influence creativity and the cognitive processes that mediate creative thought. However, these experiments failed to assess one of the most intriguing and provocative hypotheses generated by regulatory focus theory, the proposal that the hedonic tone (positivity vs. negativity) of affective states is essentially epiphenomenal to their effects on creativity. Higgins (1997) proposed that it is the regulatory foci that underlie and cross-cut both positively and negatively toned affective states that drive the impact of these states on creative cognition. To review, regulatory focus theory predicts that successful attainment of promotion goals gives rise to cheerfulness-related affect, whereas failed promotion leads to dejection-related affect; in corresponding fashion, successful prevention gives rise to quiescence-related affect, whereas failed prevention leads to agitation-related affect (Higgins, 1996; Higgins et al., 1997). Building on this framework, Higgins (1997) suggests that negative affective states associated with a promotion focus (e.g., disappointment) should significantly enhance creativity and positive affective states associated with a prevention focus (e.g., relaxation) should impair creativity.<sup>5</sup>

According to Higgins' (1997) view, earlier studies demonstrating that positive affective states, relative to negative affective states, bolster creativity and cognitive flexibility may have inadvertently confounded the regulatory focus (promotion vs. prevention) and hedonic tone (positive vs. negative) of the experimentally elicited moods or emotions. For instance, inductions of "positive affect" may have predominantly induced promotion-related, cheerfulness-related affect (e.g., happiness), whereas inductions of "negative affect" may have predominantly elicited prevention-related, agitation-related affect (e.g., tension), thereby unintentionally obscuring the underlying causal role of regulatory focus. Although this *ex post facto* proposition would be difficult if not impossible to adequately evaluate, it is most certainly possible to empirically assess the notion that regulatory focus is a more potent determinant of creativity than hedonic tone. To this end, we have begun to pilot test emotional inductions designed to separately elicit positive and negative promotion- and prevention-related affective experiences, with minimal "overlap" (e.g., to elicit agitation-free, dejection-related affect). Administration of measures of creative insight or creative generation subsequent to a "fully crossed" (Regulatory Focus  $\times$  Hedonic Tone) manipulation of affective experience will hopefully allow for a relatively diagnostic initial assessment of Higgins' (1997) innovative hypothesis.<sup>6</sup>

### *Regulatory Focus and Retrieval Inhibition*

Among the most thought-provoking findings in the current study are those of Experiment 4, which suggest that regulatory-focus cues influence creativity by way of their impact on retrieval blocking. To review, promotion cueing, relative to prevention cueing, did not generally enhance retrieval of solutions to a word-fragment completion task, but only facilitated performance after an initial memory search in which material was activated that could

obstruct retrieval of novel solutions. Presumably, the "risky" explorative processing style associated with a promotion focus, relative to the risk-averse, perseverant processing style associated with a prevention focus, enhances the tendency or ability to escape fixation on this initially activated, obstructive material, thereby bolstering retrieval of blocked solutions.

Although speculative at present, these findings suggest that the effects of regulatory focus cues may carry beyond creativity to the many domains of cognitive processing in which retrieval inhibition is posited to play a role. As suggested many years ago by Roediger and Neely (1982; see also Smith, 1995; Smith et al., 1993), the same memory blocking mechanism that produces *Einstellung*, or fixation effects in creative problem solving (e.g., Duncker, 1945) may also underlie such phenomena as the "tip of the tongue" effect (see Brown, 1991, for a review), part-set cueing inhibition (e.g., Rundus, 1973), and output interference (e.g., Karchmer & Winograd, 1971). If so, it is possible that promotion and prevention foci (and cues associated with them) might differentially influence each of these classic phenomena in a manner analogous to that in which they influence creativity—momentary or chronic prevention foci should impair retrieval of occluded (Anderson & Bjork, 1994) information, whereas momentary or chronic promotion foci should mitigate this occlusion and thereby facilitate retrieval of desired or desirable information to which access is currently denied. At present, we are actively investigating this hypothesis, in hopes that we might elucidate the processes that moderate these intriguing and insufficiently understood phenomena and, more generally, shed new light on the fundamental, synergistic (Sorrentino & Higgins, 1986) link between motivation and cognition.

<sup>5</sup> E. T. Higgins (personal communication, July, 2000) has also recently suggested that positive promotion-focused affective states (e.g., happiness) may bolster creativity more than negative promotion-focused states (e.g., disappointment), and that negative prevention-focused affective states (e.g., anxiety) may impair creativity more than positive prevention-focused states (e.g., relaxation).

<sup>6</sup> Although a strong test of this hypothesis would require manipulation of positive and negative promotion- and prevention-related affective states, correlational evidence from pre- and posttask emotional state inventories would serve to provide converging support. As a *post hoc* attempt to glean such support, we returned to Experiments 2, 4, and 5 and computed composite regulatory focus related emotion scores from pre- and posttask measures of transient affect. Consistent with the suggestions of Higgins (1996), these scores were calculated from averaged ratings of any and all of the following emotions: for positive promotion-related affect, happy, content, cheerful, and joyful; for negative promotion-related affect, discouraged, disappointed, depressed, and down; for positive prevention-related affect, calm, relaxed, and relieved; and for negative prevention-related affect, tense, worried, concerned, and nervous. These four composite scores were substituted in all regression analyses for the positive and negative affective scores reported above. No reliable effects of these scores on any dependent measure were obtained. Of course, these null findings do not contradict Higgins' (1997) hypothesis, but merely emphasize the need for new studies explicitly manipulating the affective states at issue and gauging their effects on creative cognition.

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