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Chapter 6

IS THE CONSCIOUS SELF A HELP, A HINDRANCE, OR AN IRRELEVANCE TO THE CREATIVE PROCESS?

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Abstract

Four studies suggested that conscious processing makes valuable, essential contributions to the creative process. A conscious goal to be creative elicited more creative story titles, whereas nonconscious priming of creativity failed to increase creativity. A cognitive load that preoccupied conscious processing lowered the creativity of musical improvisation, while uncreative aspects of performance were unaffected. Conscious distraction reduced the creativity of drawings — but again did not have any impact on the uncreative aspects of performance. Depletion of the conscious self's resources by a manipulated exercise in habit-breaking led people to generate fewer and less creative responses on an alternate uses task. Creativity may depend on effective interplay between conscious and nonconscious processes.

Keywords: Consciousness, creativity

Is conscious thought a help or a hindrance to creativity, or indeed an irrelevant factor? Each answer is plausible on theoretical grounds.

The distinction between conscious and nonconscious parts of the mind was one centerpiece of Freudian theory and has re-emerged in recent dual process theories that emphasize two systems, one largely automatic and nonconscious, the other using controlled processes and typically marked by subjective awareness (e.g., Chaiken & Trope, 1999; Lieberman Gaunt, Gilbert, & Trope, 2002; Strack & Deutsch, 2004). The present investigation was concerned with how creativity emerges between these two. We begin by outlining four competing predictions.

The first hypothesis is that conscious processing directed by the self is useless if not an outright impediment to creative work. This view has a long tradition. Medieval and early modern poets, painters, and other artists sometimes invoked an external muse (a mythical figure) as the source of inspiration, thereby expressing the view that creativity originates outside the conscious self. Freudian theory emphasized the roots of creative inspiration in unconscious processes (Russ, 1993). Self-reports by artists sometimes treat the conscious self as an impediment (see Wegner, 2002), and many creative artists claim that they do not deliberately or consciously control the genesis of creative inspirations. Philosophers have asserted that the conscious mind is irrelevant to creative genesis (Dennett, 2003). Conscious monitoring of the quest for insight can sometimes impair problem-solving performance (Schooler & Melcher, 1995). Even those theorists who have proposed that conscious processing has distinct abilities and functions have tended to identify those as following explicit rules, such as for logical reasoning (Dijksterhuis & Nordgren, in press; Lieberman et al., 2002; Sloman, 1996; Smith & DeCoster, 1999, 2001), whereas following strict and standard rules is hardly a recipe for creativity — indeed, one could assume that successful creativity might entail breaking free of those rules.

The second view is that creative work is a product of conscious processes and even free will (Pressing, 1988). This view holds that the creative process consists of deliberate, conscious choice. Although not widely held, this view can point at least to several observations that call into question the exclusive focus on nonconscious creativity. Intentional artistic creativity seems far more pronounced among conscious beings such as humans than in other species. If conscious thought impedes creativity, then humans, as the most conscious of animals, ought to be the least creative, yet with creative art (at least) humans appear to be the most creative. Another relevant observation invokes the principle that conscious thought is distinctively capable of enabling individuals to transcend their immediate stimulus environment, such as to conceptualize possible future events (e.g., Gazzaniga, 2003; also Baumeister, 2005). If so, then thinking about the future would be one manipulation that can be assumed to activate conscious processing. Recent studies by Förster, Friedman, and Liberman (2004) showed that having people focus on a distant future time (one year from now, as opposed to tomorrow) caused them to generate more creative ideas and solutions. Thus, again, the state linked to more conscious processing apparently promoted greater creativity.

A third hypothesis attempts to integrate these contradictory lines of thought. Perhaps creative inspirations do in fact originate in nonconscious processes, but the conscious system and its controlled processes play a vital role in receiving and integrating them so as to fashion a creative final product. This would be consistent with Morsella's (2005) characterization of consciousness as vital to processes that require skeletor muscles for execution. In that view, automatic processes can generate a multiplicity of possible but mutually incompatible responses, and consciousness operates at the bottleneck (so to speak) at which only one can be carried out, insofar as the body can only perform one of them at a time. For example, the nonconscious processing in the mind of a jazz trumpeter who is improvising a solo might generate several possible melody lines that would be viable given the chord structure for the upcoming few seconds, but the mouth and fingers can only play one of them, and so conscious processing is needed to choose which one.

The fourth rival hypothesis tested in this work is based on Bargh's auto-motive model (1990), in which cues activate nonconscious motivations that in turn guide behavior, often with little or no recognition by conscious or controlled processing. In this view, creativity would be neither automatically self-generated nor guided by conscious processing. Rather, creativity would only arise insofar as the nonconscious *motivation* to be creative were activated by cues, after which automatic processes would produce the result. The cues that activate the motivation to be creative could come from internal or external sources and could invoke or bypass conscious processing. A growing body of work has attested to the functional equivalence of consciously intended and nonconsciously activated processes of goal-directed behavior (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Troetschel, 2001; Chartrand & Bargh, 1996; Shah, 2005).

Study 1

Our first study manipulated the goal of creativity in two orthogonal ways. One involved inducing the conscious goal of being creative. The other relied on nonconscious priming of the concept of creativity. The dependent variable was how creative a title participants generated for a brief story. If activating the idea (goal) of creativity is enough to stimulate creativity, then both the conscious and the nonconscious activations should be successful. The view of consciousness as an impediment would predict that creativity would be lower when the conscious mind is engaged in trying to be creative, whereas the nonconscious priming would produce maximal creativity. The view that consciousness serves an essential function in the creative process would predict that nonconscious priming alone would not increase creativity, whereas conscious goal induction could be successful.

Method

Forty-nine students (30 women) participated in connection with a course requirement. They were randomly assigned among three conditions. The experimenter described the study as an investigation of verbal ability and announced that participants would be performing some word games, reading a short story, and generating titles for the story. He then distributed a packet that contained all the experiment materials.

The first item in the packet was a sentence-unscrambling task modeled on prior nonconscious goal-priming research (see Srull & Wyer, 1979; Chartrand & Bargh, 1996). Participants were presented with 15 four-word clusters. They were instructed to find the three words in each cluster that best formed a meaningful phrase and then cross out the fourth, irrelevant word. In the creativity priming condition, eight of the four-word clusters related to creativity (e.g., “boating your imagination use”, “originality near is cool”) and the others did not relate to creativity (e.g., “pencil cats mice like”, “he dishes the wash”). In the no-priming control condition, all 15 of the clusters formed neutral phrases and did not relate to a common theme. In particular, none invoked creativity.

The next item in the packet was a short story. Participants were instructed, “Please read the short story on this page. When you are finished reading, print five possible titles that fit the short story”. These instructions were followed by a one paragraph story adapted by Eisenberger and Rhoades (2001) from Seyba (1984). It read as follows:

> *You are a tiny golden kernel of popcorn lying in the bottom of a frying pan. Look around you and see the other popcorn kernels that are snuggled up close to each other. Feel it heating, getting warmer, hotter, now burning underneath you. Close to you a popcorn kernel explodes. One by one other popcorn kernels pop to life. White clouds appear to be bursting out all around you. The sound of popping drums in your ears. You are cramped, uncomfortable, steaming hot, sweating, dizzy. Your whole body feels too tight. You are trapped within a too-tight suit. Suddenly, you, the popcorn kernel, feel yourself exploding, bursting. All at once you are light and fluffy. Bubbling up and down with other popcorn. At last the popping sound begins to quiet. Just an occasional pop, pop, and at last silence.*

The explicit creativity goal manipulation appeared after the text of the short story. Oral instructions before and written instructions after reading the story told the subject to generate possible titles. The written instructions said “On the lines below, try to come up with 5 titles for the short story.”

Crucially, in the explicit creativity goal condition, the word “creative” was inserted before “titles.” That single word was the full extent of manipulation of conscious goal activation. The experimenter’s oral instructions were not different by condition, because the experimenter was blind to condition and ran subjects in small groups consisting of subjects in different conditions, so he simply gave everyone the same instructions. The explicit creativity manipulation was only given to participants who had not received the creativity prime (so there was no condition that combined the explicit creativity stimulus with the implicit one).

Next, participants completed a state-mood measure (PANAS; Watson, Clark, & Tellegen, 1988) and a final questionnaire that asked participants to indicate whether they detected a theme in the sentence-unscrambling task, to restate the instructions they had been given regarding the naming of the short story, to rate how difficult generating titles for the story was, and to rate how creative the titles they generated were. None of these measures yielded significant effects. Participants were then debriefed, thanked, and dismissed.

Results and Discussion

Manipulation checks. All but two participants correctly restated the instructions they were given regarding the generation of titles for the short story. The two participants who did not correctly recall the instructions were excluded from all analyses. Further, none of the participants in the creativity priming condition identified the theme of the sentence-unscrambling task, suggesting that the primed creativity goal did not reach conscious awareness.

Creativity of Titles. All story titles were coded by three judges who worked independently and were blind to the experimental conditions. They rated each title on a 5-point scale running from 1 (little or no creativity) to 5 (highly creative). Instructions to the raters defined creativity as “novelty combined with quality in terms of how well the titles deal with the problem posed, in this case, naming the short story” (as used by Eisenberger & Rhoades, 2001.) Titles that were rated high in creativity included “PANdemonium”, “Popcorn Puberty”, and “A-pop-calypse”. Examples of less creative titles include “Popcorn”, “Pop Pop”, and “Popcorn Kernels”. The interrater reliability of the creativity scores provided by the three judges was kappa=.84, indicating more than adequate agreement. Creativity ratings for all five titles generated by each participant were summed, and the average of the ratings from all 3 judges were computed to form the measure of creativity. Creativity scores could range from 5 to 25.

A one-way ANOVA on the average creativity rating revealed significant variation among the groups, $F(2, 43) = 5.79$, $p < .01$. Planned comparisons revealed that story titles generated after explicit creativity instructions ($M = 11.69$, $SD = 2.30$) were more creative than titles generated in the creativity prime ($M = 9.81$, $SD = 1.76$), $t(27) = 2.50$, $p < .05$, and no prime/no instructions conditions ($M = 9.18$, $SD = 2.11$), $t(28) = 3.11$, $p < .01$. Meanwhile, the creativity priming condition and the no prime/no instruction control condition did not differ from each other, $t < 1$.

These results support the hypothesis that conscious striving has a useful role in the creative process. Explicit instigation of a conscious quest for creativity, by inserting the single word “creative” into the instructions, produced a significant increase in creativity. In contrast, implicit activation of the nonconscious goal of creativity had no effect.

Follow-Up Validation of Priming Manipulation. A possible alternative explanation for the null results for the creativity priming manipulation would be that the priming manipulation simply failed, possibly because it was poorly designed or inadequately executed. This alternative could be refuted by showing that the manipulation was effective in some way. We recruited an additional sample of 37 participants from the same population, gave them the same sentence unscrambling task (with creativity-related or neutral primes), asked them to complete the PANAS, and then administered a measure of cognitive accessibility for the concept of creativity. Specifically, participants were given a list of 24 word fragments and instructed to fill in the blanks so as to make complete words. Six of the words could be completed in either a creativity-relevant or irrelevant manner (e.g., ---ENT could be INVENT or REPENT). None of the possible answer words had been used in the priming manipulation (i.e., the sentence unscrambling task).

If the priming manipulation was effective, then creativity-related words should come to mind more easily among people who were primed with creativity than with people in the neutral prime (control) condition. As a result, subjects primed with creativity should produce more word completions pertaining to creativity than control subjects. This prediction was confirmed. Creativity-priming participants generated more creativity-related words ($M = 2.05$, $SD = 0.78$) than no-prime participants ($M = 0.83$, $SD = 0.92$), $t(35) = 4.35$, $p < .001$.

This finding indicates that the creativity priming manipulation was effective. It altered people’s automatic processing so as to make creativity-related concepts more mentally accessible. Together, the results thus far showed that priming creativity made people more likely to think of concepts of creativity, but it did not make them actually perform a task more creatively. Only the manipulation of the conscious goal of creativity made people behave more creatively.

Mood and creativity. Given prior evidence that positive mood and emotion may facilitate creativity, we tested rather thoroughly for any evidence that our manipulations affected mood or emotion. For both the main and the follow-up study, we analyzed the positive affect sum, the negative affect sum, and the 20 individual items from the PANAS. This high number of analyses raises the possibility of capitalizing on chance, perhaps especially in the validation study because it had only 2 cells. In the main study, there were no significant differences. In the subsidiary validation study, the creativity priming manipulation led to a marginal trend toward higher positive affect than the neutral prime control, t (35) = 1.75, p = .09, though there was no difference in negative affect, t<1. Furthermore, two of the 20 individual item analyses for the validation study yielded significant results. Participants in the creativity priming group reported feeling more inspired, t (35) = 3.23, p = .003, and more determined, t (35) = 2.08, p = .05, than participants in the no-prime group.

Our intention is to be as conservative as possible, but because mood explanations would provide alternative explanations to our theory, conservatism may require consideration of any signs of mood effects. At a probability of .05, one would expect that random variation would yield about one significant finding for each study (of the 22 analyses). We found none for the main study and two (plus one marginal trend) for the validation study. (It may be noteworthy that the PANAS was administered after the creativity task in the main study butdirectly after the priming manipulation in the follow-up study.) If one chooses to regard those two as genuinely significant effects, then it is noteworthy that both provide further evidence that the priming manipulation was successful. Moreover, both significant items (*inspired* and *determined*) point to motivation more than what is conventionally understood as emotion or mood. These could be taken to indicate that the implicit creativity prime really did motivate people to adopt the goal of being creative. This would provide further evidence for the conclusion that explicitly conscious goal effort is valuable for creativity, because only it led to increased creativity, whereas the implicit creativity prime produced no improvement in creativity despite activating the idea of creativity and making people feel creatively inspired and determined. Alternatively, the creativity prime may have made people more prone to self-report those feelings without actually being more determined or inspired.

The interpretation of these hints as mood effects of the implicit creativity prime is in any case of minor importance, because creativity itself failed to improve in that condition. The important conclusion to draw from the mood data is that the improved creativity in the explicit goal condition cannot be ascribed to any effects on emotion or mood, at least as reported on the PANAS in this study.

Study 2

Our second study used musical improvisation as a measure of creativity. Improvisation is a highly challenging creative task because the artist must generate a melody spontaneously and on demand, without opportunities to pause or reflect. There is no disputing that a high degree of automatic processing is essential to successful improvisation, but whether the conscious mind's participation is helpful or harmful is very much open to question. Indeed, the legendary fondness of improvisational musicians for mind-altering chemicals could itself be seen as evidence that consciousness is a hindrance, if one assumes that a major effect of such drugs is to reduce conscious thought (or even just to slow it down, which would essentially render it unable to keep up with a fast beat and chord sequence).

Study 2 tested whether musical improvisation would suffer when the conscious system was preoccupied. The high cognitive load manipulation was adapted from previous research on ironic mental processes (Wegner, Ansfield, & Pilloff, 1998; see Wegner, 1994 for a review). In the high cognitive load condition, participants counted backward from 917 by sixes. The simple cognitive load manipulation involved participants completing a relatively simple and familiar mathematical task, namely counting forward from fifteen by ones. Both these tasks require the person to speak numbers in sequence, but counting forward is presumably quite well-learned and hence should require very little conscious effort, whereas counting backward by 6s would not be familiar and therefore would preoccupy conscious attention. There was also a no cognitive load condition, which consisted of participants improvising to a background song while performing no other cognitive task.

Method

Participants were 12 male, intermediate to advanced guitarists at the Florida State University School of Music and Theatre. Each was paid $10. After warm-up, participants improvised a practice solo and then did three solos, all of which were recorded and required improvisation over different background chord progressions, the sequence of which was varied randomly. These were all about four and a half minutes long and contained one change of key, which entailed a change in the set of correct, usable notes. The first had to be done under a high cognitive load manipulation (from Wegner et al., 1998) involving counting backward by six from 917. The second improvisation was done under a simple load manipulation that required playing while counting forward by 1 from 15 (something most adults can presumably do automatically). Last, the no-load condition did not impose any conscious distractor task while improvising.

Results and Discussion

All solos were rated for creativity by one judge with advanced musical ability and blind to experimental condition. A second judge (also blind, and also with experience teaching music) rated most of them but was unable to complete all. Interrater reliability was reasonably good, r=.71 across all solos coded by both judges. Because participants furnished solos in all conditions, the observations were not entirely independent, and therefore we also computed reliability separately by condition, which in principle should reduce range and yield lower reliabilities. Range was also likely restricted insofar as all participants were advanced music students and therefore highly proficient at the task. Nonetheless, the average interrater agreement was reasonably good, r=.67 (r=.90 for the no-load control solos, r=.48 for the simple load solos, and r=.64 for the high load solos). Also, separate ANOVAs on the two sets of ratings yielded the same conclusions in terms of what differences were significant. Here we present the analyses on the full set of ratings.

One-way repeated measures ANOVA on the rated creativity of the solos indicated significant variation among the three conditions, $F(2,11)=11.32$, $p=.02$. Consistent with the hypothesis that conscious attention contributes to the creative process, solos played under high load were significantly less creative than ones played under no load, $t(11)=5.36$, $p<.001$, and less creative than ones played under simple load, $t(11)=4.51$, $p<.001$. The no load and simple load conditions did not differ in creativity. The high load solos were also less creative than the practice solos, $t(11)=8.79$, $p<.001$. The practice, simple load, and no load solos did not differ in creativity.

Our impression is that the present results understate the power of the effect. Some participants in the high-load condition were observed to try to switch attention back and forth between the counting task and the improvising task. They would say a couple numbers and then play a rush of notes, then hold a note and switch back to counting. This strategy weakened our findings but can itself be taken as further testimony to the impossibility of consciously doing both tasks at once.

Additional codings and analyses revealed that the solos played under high cognitive load did not differ from the others in terms of number of incorrect notes or in terms of keeping time within the rhythm set by the background music, all *t*s<1, *ns*. (By incorrect notes we mean bad-sounding notes that did not fit. Improvisation is done by selecting among notes in a key, which is a well-defined subset of all notes and is determined by the chord structure. The key change in each chord progression required the participant to switch to a different set of available notes in the middle of the solo. Experienced musicians can generally hear or sense such a change and automatically make the relevant adjustment, but if the automatic system were impaired by the high cognitive load then there would have been an upsurge in errors at this point.)

Thus, musical improvisations were most creative when the conscious mind was not preoccupied with another task. The cognitive load did not lead to more errors, in terms of playing wrong notes, nor did it seem to impair participants' ability to stay on the beat. We think that staying in key (thereby playing the correct, eligible notes) and keeping the beat are automatic processes and therefore unimpaired by a cognitive load.

In contrast, fashioning a creative melody line does seem to require supervision by conscious processing, even if the ideas are generated by a nonconscious process. The automatic system thrives on habit, and it will readily generate a simple pattern and stick with it. Apparently this happens when the conscious system is preoccupied. To be creative rather than repetitious, the conscious mind must interrupt a stereotyped sequence, thereby creating an opening for a different (though perhaps automatically generated) direction or phrase.

Anecdotally, several subjects expressed surprise and dismay that their creativity suffered when conscious processing was preoccupied. Apparently many musicians subscribe to the view that consciousness is an impediment to creative success, as noted above, and so they expected the loss of conscious control to liberate rather than impair creative performance. To the extent that they held these expectations, the experimental situation would have been perceived as containing a form of demand characteristic that would have worked against our hypotheses.

Study 3

Study 3 was intended as a conceptual replication of Study 2. It employed a different manipulation of cognitive load (listening to a song and counting a particular lyric) and a different measure of creativity (drawing), and it used a general college sample rather than one preselected for artistic activity. Again, the hypothesis was that preoccupying conscious attention via a cognitive load would impair the creative quality of the product but not impair the straightforward and hence presumably automatic execution of the task.

Method

73 students (53 women) participated in connection with a course requirement. Data from 5 participants were excluded from analyses (2 for equipment failure, 3 for disobeying instructions, i.e., marking paper instead of counting mentally).

Participants reported to the lab individually and were instructed that they would listen to music and draw pictures. Each participant listened to two songs whilst drawing two pictures. One picture was drawn while participants simply listened to a song, and the other picture was drawn while participants listened carefully to a song in order to count occurrences of the word "time." Both songs ("Time Zones" by Negativland, 1987, track 15, and "48 Hours," by Negativland, 1989, track 8) were about 5.5 min long and used the word "time" 16 or 18 times. Also, both are cacophonous and feature multiple layers of vocals that require close attention to follow. The order of the songs, pictures drawn, and cognitive load manipulation were counterbalanced across participants. Thus, in the cognitive load condition, participants had to listen carefully and draw a picture simultaneously. When the song ended in the cognitive load condition, participants reported the number of times they had heard the word "time". We made an a priori decision to exclude any participants whose counts were wildly inaccurate, on the assumption that such inaccuracy would reveal a failure to follow the instruction to attend to the load task and hence an unwanted surplus of attention focused on the drawing task. The criteria for exclusion involved counting fewer than 10 or more than 25 occurrences of the word "time." No participants were excluded on that basis, indicating that they were all following instructions and attending reasonably well to the stimulus songs. Three participants were however excluded for making marks on the drawing sheet to keep count of the word "time."

Both drawings had to contain four common objects (house, car, person, and tree; building, airplane, face, and flower), and participants were free to draw the objects however they wanted. An index card listing the relevant objects was placed in front of participants for easy referral. Before drawing a picture, participants were informed that they should stop drawing when the song ended, which would be in approximately 5 minutes. Participants were told to begin drawing as soon as the music started because 5 minutes was just enough time to draw the required picture. Then participants were given a sheet of paper and a box of 18 colored pencils with which to draw, and then the experimenter pressed play on the CD player to begin the first song.

After drawing the first picture, participants completed the Brief Mood Introspection Scale (BMIS; Mayer & Gaschke, 1988). Then, participants drew the second picture, rated how difficult it was to draw each picture, and evaluated how creative their drawings were. Last, participants were debriefed, thanked, and dismissed.

Results and Discussion

Manipulation checks. Not surprisingly, participants found it more difficult to draw a picture under cognitive load (M = 3.40, SD = 1.64) than under no such load (M = 2.32, SD = 1.54), F (1, 67) = 19.99, $p < .01$. Difficulty ratings were unaffected by topical assignment (house-car-person-tree vs. building-airplane-face-flower), song, or sequential ordering, all Fs < 1.

Drawings. All drawings were coded independently by two judges blind to experimental conditions and to hypotheses. The drawings were coded on four dimensions: creativity (defined for the judges as whether the drawing was "novel and also appropriate for the task"; see Eisenberger & Armeli, 1997; Eisenberger & Rhoades, 2001), uniqueness (whether it was unlike other drawings), coherence (the degree to which individual objects in a drawing formed a unitary scene), and liking (whether the judge liked the picture). Interrater reliability of the two creativity ratings was satisfactory, $r = .64$, which is respectable given the idiosyncratic nature of creativity judgments. We combined the raters' creativity judgments and performed a repeated-measures ANOVA on them.

As predicted, the non-load pictures ($M = 4.30$, $SD = 1.44$, on a scale from 1 to 7) were judged as more creative than the cognitive load pictures ($M = 3.83$, $SD = 1.49$), $F(1, 67) = 7.16$, $p < .01$. Participants' ratings of their own drawings yielded a similar finding, with the non-load drawings rated as more creative ($M = 3.62$, $SD = 1.56$) than the drawings made under cognitive load ($M = 3.16$, $SD = 1.41$), $F(1, 67) = 4.10$, $p < .05$.

We performed parallel ANOVAs on the uniqueness, liking, and coherence ratings. Consistent with the creativity pattern, no-load drawings were rated more unique ($M = 4.31$, $SD = 1.57$) than drawings made under cognitive load ($M = 3.71$, $SD = 1.60$), $F(1, 67) = 9.12$, $p < .01$. The liking scores revealed the same pattern. Pictures drawn with no concurrent cognitive load ($M = 4.33$, $SD = 1.27$) were liked more than pictures drawn under cognitive load ($M = 3.91$, $SD = 1.29$), $F(1, 67) = 6.34$, $p < .02$.

No differences were found on other measures. The two sets of drawings were rated as equally coherent.

We tested the possibility that creativity ratings might have been influenced by how colorful the pictures were. It was plausible that the cognitive load might have reduced the usage of multiple colors and that judges might have been swayed to rate the lesser color variety as lesser creativity. Two new judges counted the number of colors (out of 18) used in each drawing. Disagreements were rare and easily resolved by discussion, which nearly always revealed that one or the other judge had failed to notice one different color, and so the discussion process yielded 100% agreement. ANOVA revealed that the number of colors used was nearly identical in the two conditions, with both groups using about 7 of the 18 colors (load $M = 6.72$, $SD = 1.78$; non-load $M = 7.01$, $SD = 1.92$), $F<1$, *ns*. Furthermore, creativity ratings did not correlate with the number of different colors used in either the load, $r(68) = -.01$, $p = .93$, or no-load drawings, $r(68) = .08$, $p = .53$.

In summary, drawing pictures while performing a distracting, concurrent task affected the creativity, uniqueness, and likability of the drawings. However, participants were perfectly able to draw the objects required for the pictures, to create coherent scenes with those objects, to use a variety of colors, and to finish on time when the drawings were made under cognitive load. Thus, only some aspects of drawing were affected by cognitive load. We suggest that creativity and uniqueness suffered because those aspects of drawing rely on conscious awareness and direction.

Study 4

Our final study took a very different approach. On the assumption that effortful conscious processing consumes the self's limited energy reserves, we manipulated the available energy by having some participants first engage in a habit-breaking task. Such effortful self-regulation has been shown to deplete the self's resources, thereby impairing tasks that require conscious control while leaving automatic information processing relatively unaffected (see Schmeichel, Vohs, & Baumeister, 2003). If conscious control is a valuable part of the creative process, then depletion of this resource should reduce creativity.

Method

110 students participated for extra course credit. They were run individually. All were given the same initial task, which required them to cross out all (337) instances of the letter "e" in a page of text. This was done to establish the habit of crossing out "e" and enable it to be overlearned. The manipulation of resources came with the second task, which presented another sheet of text. For the no-depletion control condition the instructions were the same as for the first task. For the depletion condition, however, the instructions were to cross out all instances of "e" except if the letter was immediately followed by another vowel or if it appeared in a word that had a vowel two letters before the "e". This harder version was intended to make participants interrupt and override their habit of crossing out the "e" when the further, complex conditions were met.

The creativity task required participants to list unusual uses for a brick. They were told to list as many uses as they could but to make these uses as unusual and creative as possible. This task has been widely used in creativity research (e.g., Friedman & Förster, 2001).

Results and Discussion

Two independent judges, blind to experimental condition, rated each proposed brick usage for creativity. Interrater agreement was satisfactory (kappa=.75). The ratings were averaged and subjected to an ANOVA. Participants in the depletion condition generated significantly fewer uses (M=3.63, SD=2.08) than participants in the control condition (M=4.54, SD=2.21), $t(108)=2.98$, $p<.01$. Even more important, the uses generated by depleted participants were rated as less creative (M=2.21, SD=1.03) than the uses generated by the control condition (M=2.54, SD=0.89), $t(108)=2.54$, $p<.02$. Thus, when the self's resources for conscious processing were depleted by a prior exercise in self-regulation, performance on a standard creativity task was doubly impaired. Depleted participants generated fewer responses, and the responses they did generate were lower in creativity.

The PANAS was also used to detect possible mood differences after the self-regulatory resource depletion manipulation. There were no such differences, both Fs<1.2, *ns*, for positive and negative mood subscales. Therefore the effects on creativity cannot be explained by changes in emotion.

General Discussion

The present findings fit the hypothesis that conscious processing plays a vital role in creative work. We consistently found that preempting conscious processing impaired creative performance, whereas creativity went up when we bolstered the participation of conscious thought into the creative process. Meanwhile, activation of nonconscious processes via priming failed to produce any change in creative performance.

Given that there is no single perfect procedure for manipulating the involvement of conscious processing or of assessing creativity, the present investigation relied heavily on multimethod convergence. The present four studies used three different ways of interfering with the ability of the conscious processing system to participate in the creative process: having participants monitor song lyrics to count the instances of a target word, having them count backward by 6 from 913, and depleting their executive resources via a prior exercise of habit-breaking self-control. All of these led to poorer performance at various creative tasks. Additionally, Study 1 used a procedure to heighten the involvement of the conscious system in the creative task, namely instructing participants explicitly to try to be creative. This succeeded in increasing creativity. Also reflecting our reliance on multiple methods, these studies used four different ways of measuring creativity: naming a fictional short story, improvising a musical solo across a preset chord progression, drawing a picture with colored pencils, and generating novel uses for a brick. Thus, the present pattern of results was found consistently across different methods and cannot be dismissed as an artifact of one particular method.

Conscious processing appears to play a vital role in creativity, rather than being either irrelevant or an impediment. Creative ideas and inspirations may in fact originate in automatic processes, but conscious, controlled processing appears useful to integrate them into a creative product. In these studies, when the conscious mind was not participating fully (because it had not adopted the goal of being creative, or because its attention was directed elsewhere, or because its resources had been depleted by prior exertion), creativity was reduced.

The present studies also measured a number of other states and behaviors, which helped establish that many patterns were specific to creativity. Cognitive load impaired creativity but did not alter other important aspects of performance. The cognitively loaded musicians in Study 2 were less creative in their solos, but they were just as good as others at staying on the beat and avoiding mistakes in the sense of playing wrong (out-of-key) notes. Cognitively loaded artists were less creative in their colored pencil drawings in Study 3, but they used the same number of colors and succeeded at including all the assigned elements (thus following instructions). Without conscious control, performance was fully competent — just not very creative.

Furthermore, we included measures of mood and emotion (again, different measures in different studies) and analyzed them in multiple ways, and these analyses contradicted any suggestion that mood or emotion mediated the effects on creativity. In general, our manipulations showed no effects on mood or emotion.

Limitations and Alternative Explanations

Limitations of this work must be acknowledged. First, nothing in this research should imply that automatic or nonconscious processing is irrelevant to the creative process. On the contrary, we think the present results indicate that the interplay between the two systems is essential to creativity. The present results are at odds with one popular view, namely that creativity is fully a nonconscious process while consciousness is at best irrelevant and at worst a hindrance, but they should not be taken to suggest that creativity is wholly a conscious process. Second, our procedures did not contain any specific definition of creativity, either for our theorizing or (more important) in terms of what we told participants. They were instructed to be creative or not, were primed with the idea of creativity or not, and behaved in a creative manner or not, according to whatever that idea meant to them. The judges who coded the creative output likewise were given only the barest and broadest criteria for what constituted creativity. Other work may use specific and well-defined notions or subconcepts of creativity, but this work allowed the term to mean whatever it means to participants.

It is also important to note that although the present studies disconfirmed several of the specific predictions outlined in the introduction, they do not call into question the work or assumptions on which those are based. Thus, one prediction based on Bargh's (1990) auto-motive model held that nonconscious priming can activate responses, and although this did not happen with creative performance in these studies, we did find clear evidence that nonconscious priming rendered the idea of creativity more accessible. Likewise, we cited evidence that conscious processing is especially suited to following explicit rules, which could support the view that conscious thought would be a hindrance to creativity (which presumably breaks out of such strict rules) — but one could also suggest, at least in retrospect, that a conscious appreciation of the standard and rule-based response would even be helpful toward ensuring that one gives a different response. In other words, knowing the rules may be helpful toward breaking free of them. We further cited evidence that creative artists are sometimes reported as believing that conscious processes impede creativity, and our own informal observations confirmed that (apparently mistaken) impression: Several musicians commented spontaneously on their surprise that their creativity declined rather than increased when their conscious minds were preoccupied with counting backwards.

One might wonder whether the effects of our manipulations genuinely reflect conscious participation or could possibly be due to effects on the nonconscious processes that accompany them. In particular, might the effects of cognitive load in Study 3 be due to preoccupying the nonconscious system, which certainly had to devote some of its processing capacity to listening for the word "time" in the lyrics and therefore could not focus on the drawing task?

There are both conceptual and empirical arguments against that alternative explanation. First, the capacity of the nonconscious system is widely regarded as vast, far greater than the conscious processing system, so giving it something to do would not preoccupy or preempt most of its capacity, unlike the conscious system (e.g., Dijksterhuis & Nordgren, in press). Second, and even more important, the nonconscious system operates in parallel, so it is capable of working on fully unrelated tasks simultaneously (as it often does) (e.g., Lieberman et al., 2002), unlike the conscious system, which operates serially. Third, Study 1 did create some load on the nonconscious system, as evident from the validation study — the priming did create a vigilance or sensitivity that devoted some resources to the idea of creativity. It did not alter creativity in either direction and certainly did not impair creative performance, as compared to the neutral control. Fourth, the simple load condition of Study 2 was a kind of nonconscious load, insofar as the nonconscious system is responsible for counting. It too showed no impairment in performance. Only when the conscious system was preoccupied, for the more ambitious task of counting backwards, did creativity suffer. Fifth, the guitar study also imposed a chord change, which required an adjustment, presumably by automatic processing, insofar as it would take so long to analyze the change consciously that there would be a slew of mistakes. If one condition loaded down the nonconscious processing system to where it was unable to do its full job, there should have been a discernible increase in errors in that condition at the point of the key change, which there was not. Last, Study 4's manipulation is almost certainly not due to nonconscious load. It relied on a manipulation of ego depletion, and such manipulations have been shown to impair conscious, controlled processes but to have little or no impact on automatic processes (e.g., Schmeichel et al., 2003).

Concluding Remarks

The present results may help resolve the seeming paradox that creative artists deny that they consciously create their inspirations, and yet high creativity is mainly found among conscious beings. Perhaps the conscious mind can recognize its inadequacy for creative work, insofar as it recognizes that creative inspirations come to it from outside. It may be ironic that the conscious mind recognizes the importance of nonconscious input and in the process sometimes loses sight of its own contribution. Apparently human creativity flourishes because of the interplay between two systems — one automatic and nonconscious, the other conscious and controlled, and both indispensable.

References

Bargh, J. A. (1990). Auto-motives: Preconscious determinants of social interaction. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition* (Vol. 2, pp. 93-130). New York: Guilford

Bargh, J. A., Gollwitzer, P. M., Lee-Chai, A. Y., Barndollar, K., & Troetschel, R. (2001). The automated will: Nonconscious activation and pursuit of behavioral goals. *Journal of Personality and Social Psychology,* **81**, 1014-1027

Baumeister, R.F. (2005). *The cultural animal: Human nature, meaning, and social life*. New York: Oxford University Press.

Chaiken. S. & Trope, Y. (Eds.). (1999). *Dual-process theories in social psychology*. New York: Guilford.

Chartrand, T.L., & Bargh, J.A. (1996). Automatic activation of impression formation and memorization goals: Nonconscious goal priming reproduces effects of explicit task instructions. *Journal of Personality and Social Psychology*, **71**, 464-478.

Dennett, D. (2003). *Freedom evolves*. New York: Viking.

Dijksterhuis, A., & Nordgren, L. F. (in press) A theory of unconscious thought. *Perspectives on Psychological Science*.

Eisenberger, R., & Armeli, S. (1997). Can salient reward increase creative performance without reducing intrinsic creative interest? *Journal of Personality and Social Psychology,* **72**, 652-663.

Eisenberger, R. & Rhoades, L. (2001). Incremental effects of reward on creativity. *Journal of Personality and Social Psychology,* **81**, 728-741.

Förster, J., Friedman, R. S., & Liberman, N. (2004). Temporal construal effects on abstract and concrete thinking: Consequences for insight and creative cognition. *Journal of Personality and Social Psychology,* **87**, 177-189.

Friedman, R. & Förster, J. (2001). The effects of promotion and prevention cues on creativity. *Journal of Personality and Social Psychology.***81**, 1001-1013.

Gazzaniga, M.S. (2003: January). The when, where, what, and why of conscious experience. Presented to the National Institute on the Teaching of Psychology, St. Petersburg Beach, FL.

Lieberman, M. D., Gaunt, R., Gilbert, D. T., & Trope, Y. (2002). Reflection and reflexion: A social cognitive neuroscience approach to attributional inference. *Advances in Experimental Social Psychology,* **34**, 199-249.

Mayer, J. D., & Gaschke, Y. N. (1988). The experience and meta-experience of mood. *Journal of Personality and Social Psychology,* **55**, 102-111.

Morsella, E. (2005). The function of phenomenal states: Supramodular interaction theory. *Psychological Review,* **112**, 1000-1021.

Negativland. (1989). 48 hours. On *The perfect cut* [CD]. Lawndale, CA: SST Records.

Pressing, J. (1988). Improvisation: Methods and models. In J. Sloboda (Ed.), *Generative processes in music: The psychology of performance, improvisation, and composition* (pp. 129-178). New York: Oxford.

Russ, S. (1993). *Affect and creativity*. New York: Erlbaum.

Schmeichel, B. J., Vohs, K. D., & Baumeister, R. F. (2003). Ego depletion and intelligent performance: Role of the self in logical reasoning and other information processing. *Journal of Personality and Social Psychology,* **85**, 33-46.

Schooler, J. W., & Melcher, J. (1995). The ineffability of insight. In S. M. Smith, T. B. Ward, & R. A. Finke (Eds.), *The creative cognition approach* (pp. 249-268). Cambridge, MA: MIT.

Seyba, M. E. (1984). *Imaging: A different way of thinking*. Hawthorne, NJ: Educational Impressions.

Shah, J. (2005). The automatic pursuit and management of goals. *Current Directions in Psychological Science,* **14**, 10-13.

Sloman, S. A. (1996). The empirical case for two systems of reasoning. *Psychological Bulletin,* **119**, 3-22.

Smith, E. R., & DeCoster, J. (1999). Associated and rule-based processing: A connectionist interpretation of dual-process models. In S. Chaiken & Y. Trope (Eds.), *Dual-process theories in social psychology* (pp. 323-336). New York: Guilford.

Smith, E.R., & DeCoster, J. (2000). Dual-process models in social and cognitive psychology: Conceptual integration and links to underlying memory systems. *Personality and Social Psychology Review,* **4**, 108-131.

Srull, T.K., & Wyer, R. S., Jr. (1979). The role of category accessibility in the interpretation of information about persons: Some determinants and implications. *Journal of Personality and Social Psychology,* **37**, 1660-1672.

Strack, F., & Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and Social Psychology Review,* **8**, 220-247.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, **54**, 1063-1070.

Wegner, D.M. (1994). Ironic processes of mental control. *Psychological Review,* **101**, 34 52.

Wegner, D. (2002). *Illusion of conscious will*. Cambridge, MA: MIT.

Wegner, D. M., Ansfield, M. E., & Pilloff, D. (1998). The putt and the pendulum: Ironic effects of the mental control of action. *Psychological Science,* **9**, 196-199.