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Psychological Effects of Thought Acceleration

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Six experiments found that manipulations that increase thought speed also yield positive affect. These experiments varied in both the methods used for accelerating thought (i.e., instructions to brainstorm freely, exposure to multiple ideas, encouragement to plagiarize others' ideas, performance of easy cognitive tasks, narration of a silent video in fast-forward, and experimentally controlled reading speed) and the contents of the thoughts that were induced (from thoughts about money-making schemes to thoughts of five-letter words). The results suggested that effects of thought speed on mood are partially rooted in the subjective experience of thought speed. The results also suggested that these effects can be attributed to the joy-enhancing effects of fast thinking (rather than only to the joy-killing effects of slow thinking). This work is inspired by observations of a link between "racing thoughts" and euphoria in cases of clinical mania, and potential implications of that observed link are discussed.

Keywords: thought speed, mood, metacognition, mania, manic thinking

We all have had experiences where we feel as though our minds are racing, or at least moving faster than usual. We might take advantage of this surge in mental activity to begin writing a book or developing a new theory. Alternatively, we might simply call a friend and chatter on endlessly about our day, or lie awake at night until we write down whatever is rushing through our heads. The opposite of such experiences also is common. Many of us have had moments of feeling as though our thoughts have ground to a halt, or at least are moving slower than usual. These experiences suggest that, in everyday life, we sometimes experience differences in the speed of our thoughts. In the present research, we examine the affective experience produced by commonplace situations that influence thought speed.

Links Between Thought Speed and Mood

Variations in thought speed have been observed across a number of contexts, and the relevant findings often suggest that those variations are associated with differences in mood. For example, in the psychiatric literature, the elated mood of mania is often accompanied by "racing thoughts" and the dysphoric mood of depression is often accompanied by slowed thinking (*Diagnostic and Statistical Manual of Mental Disorders*, American Psychiatric Association, 1994). The effects of stimulant drug intake also suggest a relationship between thought speed and mood. Amphetamines, as well as the more pedestrian drug caffeine, have been shown not only to accelerate the pace of thinking on measures of cognitive processing speed, but also to elevate positive mood (e.g., Asghar et al., 2003; Smit & Rogers, 2000). Even near-death experiences have been described as involving unusually rapid thinking as well as an odd sense of euphoria (Noyes & Kletti, 1976, 1977).

More mundane experiences also appear to affect both mood and thought speed, though their effects are less powerful than those produced by having a mental illness, ingesting amphetamines, or having a near-death experience. For example, listening to fast music is thought to induce faster mental processing than listening to slow music, and listening to fast music also can elevate positive mood while listening to slow music can deflate it (e.g., Clark, 1983; Husain, Thompson, & Schellenberg, 2002). In addition, brainstorming sessions, in which individuals freely toss their ideas into a group discussion, have been shown to elicit not only rapid idea generation but also feelings of enjoyment (e.g., Nijstad & Stroebe, 2006). Some research even suggests that bouts of vigorous physical exercise can serve both to quicken people's thought and to improve their mood (e.g., Brisswalter, Collardeau, & Rene, 2002; Hansen, Stevens, & Coast, 2001; Lichtman & Poser, 1983).

Although the above research findings suggest a link between thought speed and mood, thought speed has been largely neglected as a variable in experimental research. Some previous research has looked at related ideas, for example demonstrating the *consequences* of positive mood for cognitive processes related to thought speed. Specifically, positive mood can engender broad rather than detailed thinking, loose and creative associations, reliance on cognitive short-cuts or heuristics, and more efficient cognitive processing (Fredrickson & Branigan, 2001; Gasper & Clore, 2002; Isen, 2000). Some evidence suggests that the causal link may also go the other way. For example, research has shown that manipulations that increase perceptual fluency (e.g., repeated

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exposure to a stimulus), and thereby boost the speed of mental processing, also induce positive feelings toward the fluent stimulus and elicit a general "warm glow" of positive affect (e.g., Harmon-Jones & Allen, 2001; Reber, Schwarz, & Winkielman, 2004; Winkielman, Schwarz, Fazendeiro, & Reber, 2003). In terms of more high-level thinking, Evdokas (1997) reported an intriguing result in his doctoral dissertation: inducing people to generate many rather than few responses to a Rorschach inkblot test (in a constrained time period) led them to feel more positive affect. Finally, one experiment led participants to read thought content that was either elating or depressing (see Velten, 1968) at either a fast or slow speed. The result was that people felt more positive mood after reading fast than slow, regardless of the mood content of what they had read (Pronin & Wegner, 2006).

Theoretical Rationale

Although the evidence for a causal link between thought speed and mood is not well explored (a fact that this article aims to partially rectify), there are a number of theoretical reasons to expect such a causal relationship. We now turn to a discussion of the theoretical motivation for our prediction.

People often reflect on their own cognitive activities, and such metacognitive experiences have been shown to influence self-assessments and mood by virtue of people's lay theories about the meaning of those experiences (e.g., Petty, Brinol, Tormala, & Wegener, 2007; Schwarz, 2005). For example, if people have a lay theory that "the easier it is for me to generate examples of my flaws, the more flaws I have," then they are likely to feel more flawed the more easily examples of flaws come to mind (Schwarz & Clore, 2007). Pronin and Jacobs (2007) found evidence suggesting that people possess a lay theory that fast thinking is a sign of a good mood. Participants read about a student whose thoughts were described as either "moving at an unusually fast pace" (while daydreaming, or problem-solving, depending on version), or "moving at a pace that isn't especially fast or slow." Participants who read about the student whose thoughts were faster reported that the student would experience significantly more positive affect than those who read about the student whose thoughts were slower (this was true regardless of whether the student was described as daydreaming or problem-solving). This finding, along with work on metacognitive experiences more generally, suggests that people's experience of thinking fast could boost their positive affect by virtue of their inferences about the meaning of that thought speed.

Research on brain neurochemistry provides further theoretical motivation for our prediction. Specifically, theorizing about the causes and effects of activating the dopaminergic system is relevant. Research has not aimed to directly study dopaminergic system effects of thought speed, but some studies suggest that phasic activation of dopamine neurons occurs in response to exposure to stimuli that are novel, intense, or rewarding (Berridge & Robinson, 2003; Horvitz, 2002; Schultz, 2001). Thought speed may increase dopaminergic activity if that speed involves exposure to varying (*novel*) thought stimuli at a rapid (*intense*) rate. Because dopaminergic activity is associated with experiences of reward and pleasure (Kandel, Schwartz, & Jessell, 2000), activation of it in response to rapid novel thoughts could offer a boost to positive mood. Consistent with this theorizing, it is perhaps worth noting that drugs that increase dopaminergic activity (e.g., cocaine) are generally both affectively rewarding and thought-speed enhancing (e.g., Asghar et al., 2003; Cocores, Patel, Gold, & Pottash, 1987).

Research on processing fluency provides another theoretical motivation for our prediction. That research has shown that the ease of mental processing elicits heightened positive affect (see Winkielman et al., 2003, for a review). This may be because processing ease is taken as a signal of the perceiver's general success in perceiving the relevant stimulus or as a sign of the familiarity (and safety) of that stimulus (e.g., Jacoby & Brooks, 1984; Masson & MacLeod, 1997; Winkielman et al., 2003). Object features that facilitate processing ease (or fluency) include figure-ground contrast, exposure duration, and stimulus repetition. Fluency is also associated with more rapid mental processing speed, such that stimulus features that enhance fluency (e.g., greater figure-ground contrast) also enhance processing speed. Indeed, past research involving both self-report and psychophysiological measures suggests that faster processing elicits more positive emotion even when the fact of that increased processing speed is not available via conscious reflection, as when it is elicited by repeated exposure to subliminal stimuli (e.g., Harmon-Jones & Allen, 2001; Monahan, Murphy, & Zajonc, 2000). When fluency effects occur without mediation by conscious experience, "objective fluency" (e.g., the *actual* speed and ease of mental processing) alone has an impact. Fluency effects also can result from "subjective fluency" (e.g., the *perceived* speed and ease of mental processing), when those effects involve the sort of metacognitive experiences (and lay theories) described above (Skurnik, Schwarz, & Winkielman, 2000; Winkielman et al., 2003).

Taken together, these theoretical approaches give us additional reason, beyond that provided by our initial review of empirical findings, for predicting a causal effect of thought speed on mood. In the present article, our primary aim is to provide experimental tests of a causal relationship between thought speed and positive affect. In so doing, we also explore the possible mediating role of participants' metacognitive experience of their thought speed by asking them to report on their perceptions of that speed. Such mediation would not necessarily mean that the metacognitive experience of fast thinking is required for fast thinking to elicit positive affect, but a lack of such mediation would be inconsistent with the possible role of metacognition.

The Present Research

In the present experiments, we manipulated thought speed and measured its effects on positive mood. Our research began with an experiment that sought to elicit fast thinking in a relatively unconstrained way: participants were instructed to freely brainstorm about a problem, or they were assigned to a comparison condition in which they were asked to be more selective in their generation of ideas about that problem. Experiments 2 and 3 introduced variations on this procedure, for example involving fast versus slow exposure to pregenerated ideas about the problem (Experiment 2). Experiment 4 used a different paradigm, in which participants generated answers to word problems that varied in terms of how rapidly they could be solved. Experiment 5 introduced fast, normal, and slow speed conditions to ensure that the hypothesized effect could be attributable to fast thinking increasing positive mood (as opposed to only slow thinking decreasing it). Finally, Experiment 6 sought to bolster that idea by measuring changes in participants' mood before versus after a fast or slow thought-speed manipulation. In each experiment, we tested whether participants' subjective (or metacognitive) experience of their thought speed would at least partially mediate the effect of our experimental manipulation. Thus, each of our experiments tested the general hypothesis that thinking fast rather than slow would increase positive mood (and that the effect would be at least in part attributable to the conscious feeling of thinking fast). We also aimed, in these experiments, to rule out the possibility that the predicted thought-speed effects would be merely an artifact of participants performing better (or feeling that they were performing better) under conditions of fast thinking. Finally, because our hypothesis was in part inspired by the most well-known case in which increased thought speed and positive mood co-occur—that is, clinical mania—we also explored two other well-known responses that occur during that experience (i.e., inflated self-esteem or "grandiosity," and difficulty being interrupted or "pressured speech"). In so doing, we aimed to discover whether some common sequelae of clinical mania, although dramatically reduced from their pathological forms, might result from modest situational manipulations of thought speed.

Experiment 1: Unrestrained Brainstorming

This study sought to engender thought acceleration in experimental participants and to see whether such thinking would induce positive mood. Participants were instructed to generate solutions to a novel problem. Those in the fast condition were encouraged to generate every idea that they could think of, while those in the slow condition were encouraged to generate viable ideas only. We predicted that participants in the fast condition would report thinking faster than their peers and would also display more positive mood.

Method

Participants

A total of 79 undergraduates (44 female and 35 male) participated individually in exchange for course credit.

Procedure and Experimental Manipulation

After consenting to participate in a study about "generating ideas," participants were furnished with a sheet of lined paper and a pen. They were told that we wanted them to "think about ways to make 1-year's college tuition in a summer." They were instructed to imagine that they were "faced with this challenge for the upcoming summer." They were told that they would have 10 minutes to think about the problem, and they were asked to write down their ideas. Before leaving participants to their task, the experimenter delivered a final instruction, constituting the experimental manipulation. To those in the *fast condition* (i.e., the condition designed to induce fast thinking), she said:

> Come up with any and every idea that you possibly can. As soon as you have an idea, write it down. Don't worry about whether the ideas are good or not at this stage. Just let your mind race and run free with this problem.

To those in the *slow condition*, She said:

> Come up with as many good ideas as you can. As soon as you have an idea, take the time to evaluate whether or not it is a good idea. Write down only good ideas. Just use your mind to carefully think through this problem.

After 10 minutes, the experimenter returned with a questionnaire packet. After participants completed it, they were asked to look back at the list of ideas they had written and to draw a star next to each idea that they thought was a "good idea."

Measures

Positive affect. Participants completed the positive affect scale of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). This scale asks participants to report how much they currently are feeling various positive emotions: that is, *excited*, *enthusiastic*, *attentive*, *interested*, *alert*, *active*, *strong*, *determined*, *inspired*, *proud* (1 = *very slightly*, 5 = *extremely*; Cronbach's alpha = .87). To determine whether specific subcomponents of the positive feeling state were present while others were absent, or whether the state was more diffusely positive, we augmented this scale with a number of additional items (i.e., *happy*, *creative*, *powerful*, *tired* [reverse-scored], *insightful*), thus creating our measure of positive affect (Cronbach's alpha = .90). The inclusion of these items allowed us to examine four subcomponents of positive affect: *elation* (*excited*, *enthusiastic*, *happy*; $\alpha = .77$); *heightened energy* (*alert*, *tired* [reverse-scored], *attentive*, *active*; $\alpha = .68$); *feelings of creativity* (*creative*, *insightful*, *inspired*; $\alpha = .75$); *feelings of power* (*strong*, *powerful*, *determined*; $\alpha = .73$).

Felt thought speed. Participants indicated their subjectively experienced thought speed, by answering the question: "Sometimes people have the feeling that their thoughts are coming slowly, and other times people feel that their thoughts are 'racing.' What did you feel was the speed of your thoughts, as you thought about the problem?" (1 = *very slow*, 9 = *very fast*).

Inflated self-esteem/grandiosity. As a measure of inflated self-esteem (or "grandiosity"), participants completed the State Self-Esteem Scale (Heatherton & Polivy, 1991), consisting of 20 statements dealing with ongoing feelings of self-esteem. The scale includes subscales for performance esteem (e.g., "I feel confident about my abilities"), appearance esteem (e.g., "I am pleased with my appearance right now"), and social esteem (e.g., "I am worried about what other people think of me"), with all items anchored at 1 (*not at all*) and 5 (*extremely*). As another potential measure of grandiosity, participants completed the *Behavior Identification Form* (BIF; Vallacher & Wegner, 1989), which probes for people's tendency to identify their behaviors at a high level (i.e., one that attaches larger meaning to the behavior). Respondents choose between two descriptions of a single behavior where one of the descriptions is low-level and the other is high-level (e.g., *reading* as either *following lines of print*, or *gaining knowledge*). Scores are based on the number of high-level alternatives chosen (out of 25 items).

Negative affect. As a measure of negative affect, participants completed four items from the negative affect scale of the PANAS (*distressed*, *hostile*, *jittery*, *irritable*; Cronbach's alpha = .73). We had no predictions for this measure because our analysis of the literature suggested that positive mood tends to increase with thought speed, but did not contain examples of consistent differences in negative mood. See Appendix for a summary of measures used in this study.

Results and Discussion

Positive Affect

Participants in the condition designed to induce fast thinking reported more positive affect than did participants in the condition designed to induce slow thinking (Ms = 2.90 vs. 2.43, SDs = .65 and .73), $F(1, 77) = 9.20$, $p = .003$. As can be seen in Table 1, participants in the fast condition also scored higher on each of the scale subcomponents—that is, *elation,* $F(1, 77) = 4.46$, $p = .04$, *energy*, $F(1, 77) = 10.42$, $p = .002$, *power*, $F(1, 77) = 5.34$, $p = .02$, and *creativity*, $F(1, 77) = 7.61$, $p = .007$.

The Role of Felt Thought Speed

We next examined whether participants' subjective experience of their thought speed mediated the relationship between experimental condition and positive affect. Consistent with our hypothesis, participants in the fast condition perceived themselves as thinking faster than did those in the slow condition (Ms = 5.88 vs. 4.49, SDs = 1.40 and 1.93), $F(1, 77) = 13.70$, $p = .0004$. Moreover, we found that across conditions the faster participants felt they were thinking, the more positive affect they felt, $r(77) = .33$, $p = .003$. The Sobel test advocated by Baron and Kenny (1986) revealed that the effect of experimental condition on positive affect diminished marginally when felt thought speed was included in the model, $z = 1.84$, $p = .06$. We also examined the within-cell correlations between thought speed and mood, with a particular interest in whether those who were *not* in the fast condition would also report relatively more positive affect *if* they thought relatively fast in that condition (for an explanation of this "mediational" strategy, see Spencer, Zanna, & Fong, 2005). The correlations were: slow condition, $r(37) = .32$. $p = .047$, and fast condition, $r(39) = .33$, $p = .003$.

Table 1
Means and Standard Deviations for Experiment 1

Measure	Speed of thought condition	
	Slow	Fast
Elation		
M (*SD*)	2.52 (0.96)	2.96* (0.90)
High Energy		
M (*SD*)	2.46 (0.70)	2.99* (0.76)
Feelings of Power		
M (*SD*)	2.39 (0.96)	2.85* (0.79)
Feelings of Creativity		
M (*SD*)	2.38 (0.86)	2.89* (0.82)
State Self-Esteem		
M (*SD*)	3.34 (0.47)	3.59* (0.46)
Behavior Identification Form (BIF)		
M (*SD*)	13.30 (4.74)	14.58 (4.45)

Note. Higher numbers indicate greater expression of the relevant state. All measures were on 5-point scales, except for the BIF (on which scores represent the number of high-level responses out of 25).
* Indicates difference between the two thought-speed conditions at $p < .05$.

The Role of Alternative Mechanisms

For purposes of comparison, we also tested an alternate mediational model whereby our manipulation of experimental condition might have led participants to feel positively by influencing their actual (rather than felt) rate of thought production. First, we found that participants in the fast condition did in fact list a larger number of thoughts than their peers in the allotted 10 minutes (Ms = 15.59 vs. 6.79, SDs = 8.41 and 2.89), $F(1, 77) = 38.29$, $p < .0001$. Although the number of thoughts that participants generated in 10 minutes was correlated with their affect, $r(77) = .22$, $p = .048$, the Sobel test revealed that this factor did not mediate the effect of experimental condition on positive affect, $z = .40$, *ns*.

We next tested a third possible model, whereby participants may have felt more positively because they had succeeded in generating better quality ideas. To test this possibility, we first had two research assistants rate the creativity of every idea generated by every participant, as a function of the idea's novelty and usefulness (1 = *not at all creative*, 5 = *extremely creative*; interrater reliability coefficient $\alpha = .77$). The ideas of participants in the fast condition were rated as less creative than those of their peers (Ms = 2.37 vs. 2.64, SDs = .33 and .34), $F(1, 74) = 12.82$, $p = .0006$. This effect was not because of fast-condition participants having generated so many ideas that their creativity petered out toward the end; the same result emerged when only the first seven ideas generated by each participant (i.e., the average number generated by participants in the slow condition) were examined (Ms = 2.34 vs. 2.63, SDs = .41 and .34), $F(1, 74) = 11.97$, $p = .0009$. Moreover, the creativity of participants' ideas (using either standard) did not correlate with positive affect (rs = −.15 and −.12, respectively, ps > .15).

Finally, because subjective feelings of success might be a better candidate for mediation than objective success, we looked to test a fourth alternative model whereby participants may have felt more positively in the fast condition because they felt more successful. In fact, participants in the fast condition saw their ideas as being of *worse* quality than did those in the slow condition. Specifically, those in the fast condition indicated that less than half of their ideas were "good ideas," whereas their peers reported that more than half of their ideas were good (Ms = .44 vs. .57, SDs = .19 and .27), $F(1, 74) = 5.98$, $p = .02$. We also were able to address this fourth model in a different way, by examining whether the effect of condition on positive affect was mediated by participants' feelings of success, as measured by the performance subscale of the State Self-Esteem Scale (sample items: "I feel frustrated or rattled about my performance"; "I feel like I'm not doing well"). We found that experimental condition did not predict scores on this measure, $F(1, 78) = 1.49$, $p = .23$, thereby ruling out any possible mediation (Sobel test $z = 1.02$, *ns*.).

Additional Measures

Inflated self-esteem/grandiosity. Participants in the fast condition reported higher state self-esteem than their peers, $F(1, 77) = 5.89$, $p = .02$. Results on the BIF, however, did not significantly differ, $F(1, 77) = 1.55$, $p = .22$ (see Table 1).

Negative affect. Participants showed no differences between the fast condition and the slow condition in negative affect (Ms = 1.55 vs. 1.62, SDs = .64 and .73), $F(1, 77) = .17$, *ns*.

Conclusions

The results of this study offer initial support for the hypothesis that inducing people to think fast rather than slow leads them to experience more positive affect. Moreover, these results provide a tentative suggestion that the subjective experience or "feeling" of fast thinking mediates its mood effects. The results provide an initial suggestion that these effects are not mediated by perceptions of idea quality or rate of idea production.

Because this experiment manipulated thought speed somewhat indirectly—by virtue of brainstorming instructions—it is possible that some other property of those instructions may have induced the observed mood effect. For example, those instructions may have led participants in the fast condition to generate different idea content from their peers, and that difference may have led them to feel more positively. Our raters did not find their ideas more creative, but perhaps some other content-related difference occurred. Our next study sought to address this concern by controlling not only the speed of participants' thoughts, but also the content of their thoughts.

Experiment 2: Exposure to Multiple Ideas

Rather than generating their own ideas for making money during the summer, participants read ideas presented to them for the putative purpose of aiding their own thought process. The ideas were presented on a computer screen, at a speed that was either designed to induce the experience of fast thinking or the experience of thinking at a slower speed.

Method

Participants

A total of 77 undergraduates (58 female and 19 male) participated individually in exchange for course credit.

Procedure

After consenting to participate, participants were told that we wanted them to think about ways to make one year's college tuition in a summer. "To help you in doing this," we told them, "you will be exposed to a number of ideas generated by other students." Participants were assured that they would not be tested on any of the ideas, and rather that the purpose of seeing them was "to help aid your thinking process about this problem." They were informed that at the end of the experiment, they would be asked to tell us their ideas.

Before being exposed to the ideas (see below), participants were told that they should read aloud each idea as it appeared on their computer monitor. After reading the ideas, they completed our questionnaire packet. Finally, the experimenter gave them "30 seconds to tell me what you think you would do, if you were faced with the problem of ways to make one year's college tuition in a summer." She then turned on a tape recorder and instructed them to begin. After 30 seconds, she interrupted them, saying: "Okay—30 seconds."

Thought Stimuli and Experimental Manipulation

The ideas that participants saw were drawn from those generated by participants in Experiment 1. Specifically, every idea generated in that experiment was classified by its content into one of seven categories (i.e., soliciting funds, running a business, cultivating fame and fortune, working for hourly pay, using specialized skills, selling or renting things, and engaging in risky ventures), and the nine most reasonable ideas from each category were selected for use in this experiment (the ideas that were excluded primarily involved suggestions that were patently absurd, such as "hunt for a buried treasure"). In the *fast condition*, each of the 63 resulting ideas was presented in a fixed random order, for 225 milliseconds per word (i.e., slightly faster than normal silent reading speed, which is 250 milliseconds per word; Glass & Holyoak, 1986). In the *slow condition*, each of seven ideas was presented for nine times as long. To ensure that the two experimental conditions were equal in duration, participants in the slow condition were shown one-ninth of the ideas in the fast condition. That is, they saw the strongest idea from each category (as judged by three undergraduate raters). Thus, although the experimental manipulation took the same length of time in both conditions, participants were induced to process ideas at a faster pace in the fast condition.

Measures

Participants responded to the same measures (of affect, subjectively experienced thought speed, and inflated self-esteem) as in the previous experiment[1] (see Appendix).

Participants' tape recordings also were used as data. Three judges (i.e., the experimenter, and two undergraduates uninformed of participants' condition and of our hypotheses) were provided with a definition of grandiosity, drawn from clinical descriptions, emphasizing the individual's "inflated appraisals of his or her self-worth, contacts, status power, or knowledge, as evidenced, for example, by boasts, sensational plans, or claims of unlikely power, status, knowledge, or contact"; at its most extreme, they were told, the individual might "hear voices praising" him or her, or even see or hear such praises from a higher power. The judges rated participants using a 7-point scale (1 = *not at all grandiose*, 7 = *extremely grandiose*); interrater reliability: Cronbach's alpha = .70. The tape recordings also were used to assess participants' tendency toward *pressured speech*, defined by its nonstop nature and difficulty to interrupt (*DSM–IV*, 1994; Goodwin & Jamison, 1990). We assessed whether participants spoke for longer than their peers, and whether they continued speaking after the experimenter's signal (at 30 seconds) that it was time to stop.

Results and Discussion

Positive Affect

Participants in the fast thought-speed condition reported feeling more positive affect than did participants in the slow thought-

[1] For exploratory purposes, four other items also were included, testing for feelings of friendliness, physical attractiveness, distractedness, and interest in potentially sexual interaction (i.e., dating), all of which may be symptoms of mania (see *DSM–IV*, 1994; Merck, 2004). Because these items are not the focus of the current article, and were not pursued further, we omit reporting them for the sake of brevity (but note that those in the fast condition scored higher on the former two items, $ps < .05$, and no different on the latter two).

speed condition (*M*s = 3.06 vs. 2.60, *SD*s = .72 and .69), $F(1, 75) = 6.90$, $p = .01$. As can be seen in Table 2, participants in the fast condition scored higher on the scale subcomponents of *elation*, $F(1, 75) = 5.34$, $p = .02$, *energy*, $F(1, 75) = 5.43$, $p = .02$, and *creativity*, $F(1, 75) = 6.29$, $p = .01$, though they did not feel significantly more *powerful*, $F(1, 75) = 1.59$, $p = .21$.

The Role of Felt Thought Speed

We next examined whether participants' felt speed of thought mediated the effect of speed condition on positive affect. As predicted, we found that participants in the fast condition perceived themselves as thinking faster than did participants in the slower condition (*M*s = 6.24 vs. 5.11, *SD*s = 1.69 and 1.62), $F(1, 75) = 8.95$, $p = .004$. We further found that, across conditions, the faster participants felt they were thinking, the more positive affect they reported, $r(75) = .34$, $p = .002$. We next found that, according to the Sobel test, the effect of thought-speed condition on positive affect tended to diminish when felt thought speed was included in the model, $z = 1.94$, $p = .052$. We also examined the within-cell correlations between thought speed and mood, with a particular interest in whether those who were in the slow condition reported relatively more positive affect *if* they thought relatively fast in that condition (see Spencer et al., 2005). The correlations were: slow condition, $r(34) = .33$, $p = .052$, and fast condition, $r(40) = .25$, $p = .12$.

For purposes of comparison, we also aimed to test an alternative model whereby our manipulation of experimental condition might have led participants to feel positively by influencing their actual (rather than felt) thought speed. In this experiment, our proxy measure of participants' thought speed was their rate of speaking while presenting their ideas. Although participants in the fast condition spoke for longer than those in the comparison condition ($M = 32.24$ seconds vs. 30.11 seconds, *SD*s = 3.35 and 2.11), $F(1, 75) = 8.50$, $p = .005$, they did not generate words at a faster rate, $F(1, 75) = 1$, *ns*. That rate also did not correlate significantly with positive affect, $r(75) = .17$, $p = .14$, and, accordingly, it did not mediate the effect of experimental condition on positive affect, $z = .73$, *ns*.

Finally, we tested one other alternative model, whereby participants may have felt more positively in the fast condition because they felt more successful. To test this possibility, we examined whether the effect of experimental condition on positive affect was mediated by participants' feelings of success, as measured by the performance subscale of the State Self-Esteem Scale. Indeed, scores on this measure were higher in the fast condition versus the slow one (*M*s = 4.06 vs. 3.77, *SD*s = .57 and .71), $F(1, 76) = 4.03$, $p = .048$. Those scores also correlated with positive affect, $r(77) = .44$, $p < .0001$. The Sobel test of mediation was marginally significant, $z = 1.78$, $p = .07$.

Additional Measures

Inflated self-esteem/grandiosity. As can be seen in Table 2, participants in the fast condition reported higher state self-esteem than their peers, $F(1, 75) = 7.88$, $p = .006$. On the BIF, they showed a marginal tendency to impute larger significance to their actions than did their slow-thinking peers, $F(1, 75) = 3.70$, $p = .06$. Finally, our raters perceived fast-thinking participants to be more grandiose than their slow-thinking peers, $F(1, 75) = 7.13$, $p = .009$.

Pressured speech. Participants in the fast condition not only spoke for significantly longer than their peers (see above), but they also proved more difficult to interrupt. A total of 71% of fast-condition participants spoke past the experimenter's interruption, in comparison to 39% of their peers (*SD*s = .46 and .50), $F(1, 75) = 6.57$, $p = .01$.

Negative affect. Participants showed no differences in negative affect between the faster and slower conditions (*M*s = 1.68 vs. 1.49, *SD*s = .76 and .59), $F(1, 75) = 1.49$, $p = .23$.

Table 2
Means and Standard Deviations for Experiment 2

Measure	Speed of thought condition: Normal	Fast
Elation		
M (*SD*)	2.51 (0.85)	2.98* (0.93)
High Energy		
M (*SD*)	2.57 (0.69)	2.96* (0.76)
Feelings of Power		
M (*SD*)	2.73 (0.89)	2.98 (0.88)
Feelings of Creativity		
M (*SD*)	2.64 (0.80)	3.13* (0.93)
State Self-Esteem		
M (*SD*)	3.42 (0.50)	3.71* (0.43)
Behavior Identification Form (BIF)		
M (*SD*)	12.86 (5.60)	15.26† (5.40)
Raters' Grandiosity Assessment		
M (*SD*)	3.57 (0.97)	4.15* (0.93)

Note. All measures were on 5-point scales, except for the BIF (25-point) and Raters' Grandiosity Assessment (7-point).
* Indicates difference between the two thought-speed conditions at $p < .05$.
† Indicates difference between the two thought-speed conditions at $p < .10$.

Conclusions

The results of this experiment provide support for the hypothesis that fast thinking elicits positive affect. Participants induced to think fast about a problem, by virtue of the speed with which various ideas about the problem were presented to them, displayed more positive mood, and this effect emerged for subscales of elation, energy, and feelings of creativity (but not for feelings of power).

This experiment introduced an important control not found in our first study. Specifically, participants were not asked to think of their own ideas but instead were asked to read aloud an experimenter-provided set of ideas. Yet, there is a remaining question of experimental control raised by the present experiment. In the study, participants in the fast condition were exposed to a larger set of ideas than their peers. A useful next study, then, would manipulate participants' speed of thinking while exposing them to the same quantity of thought content.

Experiment 3: Freedom to Plagiarize

In this experiment, participants listened to a tape recording of a group of students brainstorming solutions to a problem. The experimental manipulation involved what they were led to expect they would be doing afterward. Specifically, participants in the fast condition expected that they would then be suggesting solutions to the problem to a group of people who had never before thought about it, whereas participants in the slow condition expected that they would be suggesting solutions to the *same* group they had just heard. The motivation for this indirect manipulation of speed is that participants in the condition where they are free to report the ideas that they just heard (to a new group) may have the perception of having many ideas in their heads and thus perceive that their thoughts are moving quickly. In contrast, those in the other condition may struggle to come up with ideas and thus perceive their thoughts as moving slowly. Notably, the "slow thinker" might actually think faster than the "fast thinker," in terms of objective thought speed—because the former actually must generate new ideas. Thus, the predicted results in this study might reflect people's subjective experience of having many ideas in their head (i.e., their feeling of fast thinking) rather than necessarily reflecting the actual rate of their idea production.

Method

Participants

A total of 66 undergraduates (30 female and 36 male) participated individually in exchange for course credit.

Procedure and Experimental Manipulation

After consenting to participate in an experiment on "brainstorming," participants were told that they would be listening to a group of students brainstorming about "the problem of ways to make one year's college tuition in a summer," and that they then would make their own recording of ideas about this problem. In the fast condition, they were told that their recording would go "to a new group of subjects who had never considered the problem, to spur brainstorming in their group." In the slow condition, they were told that their recording would go "back to the group of brainstorming subjects on the tape, to spur further brainstorming in their group." The experiment told participants to "listen carefully" to the tape (either because they would later be "free to use whatever ideas you hear on it" or because they would later need to "only introduce ideas you didn't hear on it"). After playing the tape (see "Thought Stimulus"), she delivered an apparently casual remark to solidify the experimental manipulation. In the fast condition, she said, "By the way, it's cool to use anything you heard on the tape." In the slow condition, she said, "By the way, I'd probably stay away from anything they said on the tape." Participants were then told that they would have 1 minute to prepare and 1 minute to record their ideas. After the recording had proceeded for 1 minute, the experimenter instructed them to stop, by saying: "Okay—1 minute." Finally, participants completed our written measures.

Thought Stimulus

The tape that participants heard was created by the researchers using the following procedure: The 63 ideas used in the previous experiment were randomly divided into five sets of 12 to 13 ideas, with one set given to each of five "actors" (i.e., three research assistants and two graduate students). The actors were seated around a tape recorder and told to pretend that they were brainstorming about ways to make a year's college tuition in a summer. They were instructed to do so by offering ideas from their lists in a natural-sounding way, with appropriate ad-libbing to make the ideas sound like part of a genuine group discussion. Several recordings were made, and the most convincing one (by group consensus) was selected for this experiment.

Measures

Participants completed similar measures to those used in the previous two experiments (see Appendix). Because the BIF was not explicitly designed to assess grandiosity, we added a new measure consisting of high-loading items from the State-Trait Grandiosity Scale (Rosenthal, Hooley, & Steshenko, 2003). The scale asks participants to rate how they are feeling "at the present moment" with respect to 20 different items (e.g., *glorious*, *larger than life*, *omnipotent*, *charismatic*, *desired*, *important*; 1 = *not at all*, 7 = *extremely*). As in Experiment 2, participants' tape recordings were used to assess pressured speech and observer-rated grandiosity.

Results and Discussion

Positive Affect

Participants in the condition designed to induce fast thinking reported more positive affect than those in the condition designed to induce slower thinking (*M*s = 2.90 vs. 2.58, *SD*s = .50 and .58), $F(1, 64) = 6.34$, $p = .01$. As shown in Table 3, participants in the fast condition scored higher on the scale

Table 3
Means and Standard Deviations for Experiment 3

Measure	Speed of thought condition: Normal	Fast
Elation		
M (*SD*)	2.47 (0.83)	2.95* (0.70)
High Energy		
M (*SD*)	2.62 (0.63)	2.88† (0.60)
Feelings of Power		
M (*SD*)	2.73 (0.69)	3.10* (0.71)
Feelings of Creativity		
M (*SD*)	2.29 (0.81)	2.75* (0.69)
State Self-Esteem		
M (*SD*)	3.61 (0.50)	3.60 (0.42)
Behavior Identification Form (BIF)		
M (SD)	14.63 (4.93)	14.94 (4.01)
Grandiosity Scale		
M (*SD*)	3.12 (1.04)	3.64* (0.85)
Raters' Grandiosity Assessment		
M (*SD*)	3.64 (0.77)	4.27* (0.57)

Note. All measures were on 5-point scales, except for the BIF (25-point) and Raters' Grandiosity Assessment (7-point).
* Indicates difference between the two thought-speed conditions at $p < .05$.
† Indicates difference between the two thought-speed conditions at $p < .10$.

subcomponents of *elation*, $F(1, 64) = 6.32$, $p = .01$, *power*, $F(1, 64) = 4.78$, $p = .03$, *creativity*, $F(1, 64) = 6.14$, $p = .02$, and marginally higher on the subcomponent *energy*, $F(1, 64) = 2.90$, $p = .09$.

The Role of Felt Thought Speed

We next sought to examine whether subjectively experienced thought speed mediated the effect of speed condition on positive affect. As predicted, participants assigned to the fast condition perceived their thoughts as being faster than did participants in the slow condition (*M*s = 4.87 vs. 3.89, *SD*s = 1.61 and 1.57), $F(1, 64) = 6.34$, $p = .01$. Moreover, across conditions, faster felt thought speed was correlated with more positive affect, $r(64) = .34$, $p = .002$. According to the Sobel test, the effect of speed condition on positive affect decreased marginally when felt thought speed was included in the model, $z = 1.75$, $p = .08$. We also examined the within-cell correlations between thought speed and mood, with a particular interest in whether those who thought relatively fast in the slow condition reported more positive affect than their slower-thinking peers in that condition (see Spencer et al., 2005). The correlations were: slow condition, $r(33) = .37$, $p = .048$, and fast condition, $r(29) = .24$, $p = .19$.

For purposes of comparison, we again tested the alternate model whereby our manipulation of experimental condition might have influenced participants' mood by virtue of its effects on their actual (rather than felt) thought speed. Although participants in the fast condition spoke for longer than participants in the slow condition (*M*s = 57.06 seconds vs. 41.34 seconds, *SD*s = 8.66 and 13.11), $F(1, 64) = 32.13$, $p < .0001$, they did not generate words at a faster rate, $F(1, 64) = .52$, *ns*. Their rate of word generation was not significantly correlated with positive affect, $r(64) = .20$, $p = .11$, and it did not mediate the effect of condition on this measure, $z = .66$, *ns*.

Finally, we tested another alternative model whereby participants may have felt more positively in the fast condition because they felt more successful at their task (which likely was easier in the fast condition). We found that experimental condition did not predict scores on our measure of perceived performance success (i.e., the performance subscale of the State Self-Esteem Scale), $F(1, 64) = .11$, *ns*., thereby ruling out possible mediation (Sobel test $z = .33$, *ns*.).

Additional Measures

Inflated self-esteem/grandiosity. Surprisingly, neither the State Self-Esteem Scale nor the BIF revealed between-condition differences (Fs < 1). However, participants induced to think fast scored higher than their peers on the State-Trait Grandiosity Scale, $F(1, 64) = 4.95$, $p = .03$. And, raters judged their taped speeches to be more grandiose than those of their peers, $F(1, 64) = 13.57$, $p = .0005$ (see Table 3).

Pressured speech. Participants in the fast condition not only spoke for longer than their peers (see above), but they also proved more difficult to interrupt. A total of 42% of fast-condition participants spoke past the experimenter's interruption, in comparison to 9% of slow-condition participants (*SD*s = .50 and .28), $F(1, 64) = 11.38$, $p = .001$.

Negative affect. Participants again showed no differences in negative affect between the fast and slow conditions (*M*s = 1.55 vs. 1.64, *SD*s = .55 and .66), $F(1, 64) = .39$, *ns*.

Conclusions

The results of this experiment augment the findings of our prior studies by using an experimental manipulation that controls for thought-content exposure across conditions. The results showed that participants in the fast condition felt that they were thinking faster than did their peers, and they displayed more positive mood.

Because this experiment manipulated thought speed in an indirect fashion, we cannot be certain that our manipulation altered participants' actual speed of thought as opposed to only their subjective thought speed. Additionally, although each of the foregoing experiments has employed different manipulations of thought speed, they all have focused on thoughts about the problem of how to make one year's college tuition in a summer. This is a difficult problem—the average income earned by a person with some college education working for three months would cover only about 22% of the participants' tuition (based on U.S. Census data; Day & Newburger, 2002). In the next experiment, we sought to address these concerns about the thought content precipitated by our thought-speed manipulations. This experiment sought to induce fast thinking, but about a less challenging subject.

Experiment 4: Task Ease

In this study, we hypothesized that even in the absence of exciting and challenging thought material, participants would still display positive affect—if their thoughts were relatively rapid. Participants were led to think quickly by completing several dull but easy word problems, whereas their peers completed slightly more difficult versions of these problems.

Method

Participants

A total of 26 undergraduates (15 female and 11 male) who described themselves as native English speakers participated individually in exchange for course credit.

Procedure

Upon providing consent, participants received a packet with instructions, a series of word generation tasks, and a packet of dependent measures.

Thought Stimulus and Experimental Manipulation

Across the two experimental conditions, the word generation task began with the following instructions: "The next few pages contain several prompts. Below each prompt, list words that come to your mind in response to that prompt. Please fill in all of the numbered spaces. Do not include multiple forms of the same word." The number of spaces provided for each prompt was the same across conditions, but the prompts were designed to be more quickly solved in the *fast condition* than in the *slow condition* so that the former would induce faster thinking. The fast condition prompts are listed below, with the slow condition prompts in brackets (and the number of prompts for each problem in parentheses): Five letter words [Eight letter words] (25); Words rhyming with "mite" [Words rhyming with "speck"] (7); Words ending with -ch [Words ending with -rch] (12); Two syllable words [Four syllable words] (25); Words starting with pa- [Words starting with pas-] (10); Words ending with the letter k [Words starting with the letter k] (20).

Measures

Participants completed our measure of thought speed, as well as the PANAS positive affect scale, the State Self-Esteem Scale, and the State-Trait Grandiosity Scale. They did not complete a measure of negative affect since our first three experiments found no evidence for effects involving it.

Results and Discussion

Positive Affect

Participants in the condition designed to induce fast thinking reported more positive affect than did those in the condition designed to induce slower thinking (*M*s = 3.15 vs. 2.51, *SD*s = .58 and .82), $F(1, 24) = 5.22$, $p = .03$. As shown in Table 4, participants in the fast condition tended to score higher on the various subcomponents of positive affect. Specifically, they were more likely to report feeling *elated*, $F(1, 24) = 4.89$, $p = .04$, and feeling *creative*, $F(1, 24) = 6.66$, $p = .02$, and marginally more likely to report feeling *powerful*, $F(1, 24) = 3.97$, $p = .06$. They did not report feeling significantly more *energetic* (though the means were in that direction), $F(1, 24) = 1.23$, $p = .28$.

The Role of Felt Thought Speed

We next investigated whether felt thought speed mediated the effect of experimental condition on positive affect. We found that participants in the fast condition perceived themselves as thinking faster than did participants in the slow condition (*M*s = 5.46 vs. 3.31, *SD*s = 1.81 and 1.84), $F(1, 24) = 9.05$, $p = .006$. Across conditions, the faster participants felt they were thinking, the more positive affect they reported, $r(24) = .70$, $p < .0001$. Finally, the Sobel test revealed that the effect of experimental condition on positive affect was diminished when the effects of felt thought speed were included in the model, $z = 2.35$, $p = .02$. We also examined the within-cell correlations between thought speed and mood, with a particular interest in whether those in the slow condition would report relatively more positive affect *if* they thought relatively fast in that condition (see Spencer et al., 2005). The correlations were: slow condition, $r(11) = .76$, $p = .002$, and fast condition, $r(11) = .42$, $p = .15$.

In addition to experiencing different thought speed depending on experimental condition, participants also performed somewhat differently. Those in the fast condition completed all 99 items ($SD = 0$), whereas those in the slow condition on average completed 91.15 ($SD = 12.38$), $F(1, 24) = 5.22$, $p = .03$. Thus, it is worth considering an alternative model whereby differences in objective success could have accounted for our results. Not surprisingly, task success was correlated with positive affect, $r(24) = .42$, $p = .03$. However, the Sobel test revealed that task success did not mediate the effect of speed condition on positive affect, $z = 1.23$, $p = .22$.

We also tested whether subjective feelings about performance success could have mediated the effect of experimental condition, particularly because participants were likely aware of their task success (i.e., of whether or not they left questions unanswered). We found that experimental condition did not predict scores on our measure of perceived performance success (i.e., the performance subscale of the State Self-Esteem Scale), $F(1, 24) = .15$, *ns*., thereby ruling out possible mediation (Sobel test $z = 1.19$, $p = .23$).

Additional Measures

Participants in the fast condition showed higher state self-esteem than their peers, $F(1, 24) = 4.38$, $p = .047$, and more grandiosity (on the State-Trait Grandiosity Scale), $F(1, 24) = 4.71$, $p = .04$ (see Table 4).

Table 4
Means and Standard Deviations for Experiment 4

Measure	Speed of thought condition: Normal	Fast
Elation		
M (*SD*)	2.44 (1.04)	3.21* (0.70)
High Energy		
M (*SD*)	2.88 (0.89)	3.22 (0.65)
Feelings of Power		
M (*SD*)	2.25 (0.72)	2.84† (0.81)
Feelings of Creativity		
M (*SD*)	2.36 (1.09)	3.31* (0.75)
State Self-Esteem		
M (*SD*)	2.38 (0.92)	3.15* (0.85)
Grandiosity Scale		
M (*SD*)	2.02 (0.62)	2.64* (0.81)

Note. All measures were on 5-point scales.
* Indicates difference between the two thought-speed conditions at $p < .05$.
† Indicates difference between the two thought-speed conditions at $p < .10$.

Conclusions

This experiment extended the results of our previous experiments to a new domain of thinking. Participants were led to think about mundane word problems rather than ambitious financial pursuits. The fact that positive affect was induced by fast thinking about such dull topics as "words rhyming with *mite*,"[2] makes clear that the speed of thought can elicit good feelings even if the content of that thought would be unlikely to.

There is one question, however, that has not been explicitly addressed in our experiments thus far. That question is whether fast thinking lifts positive mood, or whether slow thinking instead depresses it. One way to consider this question is to look back at our experimental manipulations. In Experiments 1 through 4,

[2] To ensure that this task was perceived as dull, a separate sample of undergraduates ($N = 22$) was asked to complete it, and then to "rate how dull versus exciting" it was (1 = *very dull*, 9 = *very exciting*). The modal response was a 2 on the scale, and the mean response fell significantly on the "dull" side of the midpoint ($M = 3.77$), $t(21) = 3.20$, $p = .004$.

participants in the fast conditions were led to think about problems at a rapid rate—for example, by suggesting ideas even if they were useless (Experiment 1), or by processing ideas at an unusually fast pace (Experiment 2), whereas their peers were led to think in ways that might reflect a more typical thought pace. For example, participants in the fast condition of Experiment 2 were induced to process 63 ideas in 2 minutes, whereas their peers processed seven ideas in that period; the former group was led to think unusually rapidly, but the latter group still was required to process more ideas per unit time than they could have generated themselves (as made clear by Experiment 1, in which even in the fast condition participants generated only about 1.5 ideas per minute).

Another way to address this question, though, is to collect additional data designed to more specifically address it. Our final two experiments do that, using two different approaches. In Experiment 5, we aim to employ a clear set of speed conditions—fast, slow, and normal—to see whether effects on positive mood can be attributed to the fast-speed condition relative to the normal-speed condition. In Experiment 6, we aim to examine whether clearly fast (and slow) conditions produce changes in positive affect *relative to baseline.* In this latter experiment, our inductions of thought speed are based on a paradigm developed by Pronin and Wegner (2006) in which participants are led to read at a speed that is approximately twice as fast as normal (or twice as slow). In both experiments, our principal prediction is that fast thinking will induce positive mood, though we also aim to explore whether slow thinking decreases it.

Experiment 5: Watching in Fast Forward

Participants watched a clip from the 1950s TV show *I Love Lucy* (Arnaz, 1951). It was played silently at its normal speed, or at a fast or slow speed. Participants narrated it as they watched. We predicted that those watching the fast clip would perceive their thoughts as more rapid than those in the normal condition and that they would report more positive affect. We did not have specific predictions about the slow versus normal conditions.

Method

Participants

Seventy-three undergraduates (45 female and 28 male) participated individually for course credit.

Procedure

After providing informed consent, participants were seated at a computer monitor and told they were "about to see a clip of the 1950s TV show *I Love Lucy*, starring Lucille Ball and Desi Arnaz." They were told that the clip was from an episode called "Job Switching" (Carroll, Oppenheimer, & Pugh, 1952). The experimenter then played the clip, without sound. Participants were instructed to narrate aloud what they saw during the clip. Finally, they completed our dependent measures.

Thought Stimuli and Experimental Manipulation

In the video clip of *I Love Lucy*, Lucy and her neighbor Ethel think that earning money is much easier than doing housework whereas their husbands Ricky and Fred think the opposite. Thus, the men try doing the housework while the women try working a job at the candy factory. In the episode Ricky prepares breakfast for Lucy, Lucy and Ethel visit the employment office, Lucy and Ethel try working at the candy factory, Ricky and Fred attempt cooking dinner for their wives, Ricky tries to iron a pair of stockings, and, finally, all four come to the consensus that they should remain in their respective roles.

In all three conditions, participants saw a 3-min clip. In the *fast condition,* they saw the entire 24-min episode (excluding opening and closing credits), at eight times its normal speed. In the *normal condition*, they saw a 3-min clip at its regular speed that included the scene in which Ricky, wearing an apron, tries to iron a pair of stockings. In the slow condition, they saw a portion of that 3-min segment, at 70% of its regular speed. In the fast and slow conditions, Apple Final Cut Pro software was used to alter the speed of the episode while maintaining a smooth (i.e., not choppy or visibly distorted) presentation; the speeds that were selected were chosen for being noticeably fast (or slow) without affecting picture quality.

Measures

Participants responded to the PANAS scales for both positive and negative affect. As with our past experiments, they also reported their subjectively experienced thought speed. To assess whether they understood the clip they were shown, participants were asked to write a few sentences describing what happened in the clip (all participants did so correctly).

Results and Discussion

Positive Affect

Consistent with our expectations, the thought-speed manipulation influenced participants' feelings of positive affect, $F(2, 70) = 3.97$, $p = .02$. More specifically, it induced participants in the fast condition to feel more positive affect than participants in the normal condition (Ms = 2.43 vs. 1.88, SDs = .69 and .63), $F(1, 47) = 8.53$, $p = .005$. It did not lead participants in the slow condition ($M = 2.18$, $SD = .73$) to feel significantly more or less positive affect than those in the normal condition, $F(1, 47) = 2.35$, $p = .13$, or the fast condition, $F(1, 46) = 1.50$, $p = .23$.

The Role of Felt Thought Speed

Our experimental manipulation succeeded in producing a difference between conditions in felt thought speed, $F(2, 70) = 9.54$, $p = .0002$. Participants in the fast condition perceived themselves as thinking faster than did participants in the normal condition (Ms = 5.58 vs. 4.12, SDs = 1.82 and 1.30), $F(1, 47) = 10.58$, $p = .002$. Those in the slow condition did not perceive themselves as thinking more slowly ($M = 3.71$, $SD = 1.55$) than did their normal-condition peers, $F(1, 47) = 1.02$, $p = .32$.

We next examined whether felt thought speed mediated the effect of experimental condition on positive affect. Across conditions the faster participants felt they were thinking, the more positive affect they felt, $r(71) = .35$, $p = .002$. Second, results of the Sobel test revealed that the effect of experimental condition on positive affect was diminished when the effects of perceived thought speed were included in the model, $z = 2.37$, $p = .02$. We also examined the within-cell correlations between thought speed and positive mood, with a particular interest in whether those who were not in the fast condition would also report relatively more positive affect *if* they thought relatively fast in those conditions. The correlations were: slow condition, $r(22) = .35$, $p = .09$, normal condition, $r(23) = .02$, *ns*, and fast condition, $r(22) = .45$, $p = .03$.

Additional Measure

Similar to the results of our past experiments, this experiment again found no significant effects of thought-speed condition on negative affect ($M_{fast} = 1.36$, $M_{normal} = 1.28$, $M_{slow} = 1.48$; *SD*s = .39, .29, and .53), $F(2, 70) = 1.48$, $p = .24$.

Conclusions

These results provide further evidence of the psychological effects of fast thinking. They also address the question of whether thought-speed effects on positive affect can be attributed to effects of fast versus normal thinking (rather than to effects of slow versus normal thinking). In this experiment, a fast-speed manipulation induced more positive mood than a normal-speed manipulation. A slow-speed manipulation had no significant effects. Because the slow-speed manipulation did not significantly reduce reported thought speed in this study, however, it might be that slowed speed could have effects but that we simply were not successful in manipulating it. It also is possible that any alteration of thought speed from its normal status is perceived as pleasing and elicits positive affect. Our next experiment aimed to address this question, by measuring changes in participants' mood from before to after a manipulation of thought speed.

Experiment 6: Reading Aloud, Before and After

In this study, we sought to influence positive affect using a manipulation of reading speed (Pronin & Wegner, 2006). Participants were asked to read aloud sentences on their computer screen at a slow or fast rate. We predicted that participants' mood would be more positive after fast reading. We did not have specific predictions about the slow speed condition.

Method

Participants

A total of 33 undergraduates (20 female and 13 male) participated individually in exchange for course credit.

Procedure

At the beginning of the experimental session, participants responded to the positive and negative affect scales of the PANAS. Afterward they completed an unrelated survey (concerning perceptions of equity) as filler, and then were informed about their experimental task. They were told that, in the study, they would be asked to "read words on the computer screen as they appear." They were further told that it was "important for the experiment that you're reading at all times," and that to ensure that they would be tape-recorded as they read aloud. Participants then began the reading task (see below). After the experimenter confirmed that each participant was reading aloud, she left the room until the participant was finished reading. She then returned and asked the participant to complete the dependent measures.

Thought Stimuli and Experimental Manipulation

The text that participants read described a typical day in the life of a female college student, written from that student's perspective. It started with the text: "My alarm went off this morning at eight o'clock. I got out of bed and turned it off. I went to the bathroom to brush my teeth and take a shower." It then described various activities in the student's day, including going to classes, having meals, studying at the library, and chatting with friends.

The text was presented in Arial 40-point font on participants' computer monitor such that it appeared one letter at a time until it extended across the full width of the computer monitor. Once each line of text (approximately 37 characters including spaces) appeared in full, it then disappeared and the next line appeared in the same fashion. The entire story was 86 lines. In the *fast condition*, the text appeared at a speed of 40 milliseconds per letter (with an additional 320 milliseconds before the next slide), and in the *slow condition* it appeared at 170 milliseconds per letter (with an additional 4,000 milliseconds between slides). These speeds were selected based on research (Pronin & Wegner, 2006) showing that they were, respectively, about twice as fast and twice as slow as the normal reading speed for our undergraduate population.

Measures

Participants completed the positive and negative affect scales of the PANAS both before and after the reading manipulation. The items in the scale were randomly arranged in different orders for the pre- versus postversions. As in previous studies, participants were asked to rate their subjective thought speed as they "read the statements on the computer screen" (1 = *very slow*, 9 = *very fast*). As a measure of subjective fluency, they also were asked: "How easy or difficult did it feel to read the statements on the computer screen?" (1 = *very difficult*, 9 = *very easy*). Participants also completed the State Self-Esteem Scale.

Results and Discussion

Affect Changes From Baseline

The primary prediction in this study concerned changes in positive affect from before to after the manipulation of thought speed. Consistent with our predictions, participants reported more positive affect after participating in the fast condition than they did at baseline (*M*s = 4.59 vs. 3.63, *SD*s = 1.52 and 1.30). This difference was significant according to a repeated measures ANOVA, $F(1, 16) = 13.14$, $p = .002$. The reverse was true for participants in the slow condition: They reported *less* positive affect after participating in the slow condition than they did at baseline (Ms = 3.70 vs. 4.28, SDs = 1.43 and 1.01), $F(1, 15) = 7.17$, $p = .02$. The experience of reading fast inflated positive affect, whereas the experience of reading slow deflated it.

We also examined potential effects of the speed manipulation on negative affect. Participants in the fast condition showed no difference in negative affect after versus before the manipulation (Ms = 2.34 vs. 2.52, SDs = 1.12 and 1.57), $F(1, 16) = .30$, *ns*. Those in the slow condition reported marginally less negative affect after the manipulation than before it (Ms = 1.51 vs. 1.78, SDs = .61 and .82), $F(1, 15) = 4.23$, $p = .06$.

Differences Between Conditions

Positive affect. We next sought to ensure that the results of our previous experiments, involving differences between speed conditions, were replicated in this experiment. First, we found that participants in the fast condition reported more positive affect than participants in the slow condition, after controlling for chance differences in baseline affect ($Ms_{adjusted}$ = 4.89 vs. 3.39), $F(1, 30) = 17.10$, $p = .0003$.

Roles of felt thought speed, subjective fluency. As in previous studies, participants in the fast condition reported thinking faster than their slow condition peers (Ms = 6.59 vs. 3.89, SDs = 1.46 and 1.71), $F(1, 31) = 24.16$, $p < .0001$. Across conditions, the faster participants felt they were thinking, the more likely they were to report increased positive affect relative to baseline, $r(31) = .63$, $p < .0001$. According to the Sobel test, the effect of thought-speed condition on positive affect was partially mediated by participants' subjectively felt thought speed, $z = 1.96$, $p = .050$. We also examined the within-cell correlations between thought speed and mood, with a particular interest in whether those who were in the slow condition also reported relatively more positive affect *if* they thought relatively fast in that condition. The correlations were: slow condition, $r(14) = .47$, $p = .07$, and fast condition, $r(15) = .29$, $p = .26$.

We also looked at whether participants' feelings of ease versus difficulty during the reading task mediated the effects of speed condition on positive affect. Participants did not show a significant tendency to feel that fast reading was easier than slow reading (respective Ms = 5.59 vs. 6.69, SDs = 1.94 and 2.15), $F(1, 31) = 2.38$, $p = .13$. Feelings of ease versus difficulty were not correlated with increased positive affect relative to baseline, $r(31) = .02$, *ns*.

We next examined whether participants' greater positive affect in the fast condition was mediated by their having felt more successful about their performance in that condition. There was no evidence for this, as participants did not report feeling more successful in that condition (indeed, they reported feeling marginally less successful; Ms = 3.72 vs. 4.09, SDs = .64 and .54; $F(1, 31) = 3.10$, $p = .09$).

Additional measures. Interestingly, participants reported lower state self-esteem in the fast condition than in the slow condition (Ms = 3.50 vs. 3.87, both SDs = .50), $F(1, 31) = 4.69$, $p = .04$. They also showed a marginal tendency to report more negative affect in that condition, after controlling for chance differences in baseline affect ($Ms_{adjusted}$ = 2.19 vs. 1.68), $F(1, 30) = 3.57$, $p = .07$.

Conclusions

This experiment further provides evidence supporting our hypothesis that thought speed influences positive affect. Participants reported more positive mood after our fast-thinking manipulation than before it, and they reported less positive mood after our slow-thinking manipulation than before it. These results thus suggest that effects of thought speed on mood can involve both the joy-enhancing effects of fast thinking as well as the joy-dampening effects of slow thinking.

The present study also provides further support for the partially mediating effects of subjectively experienced thought speed on mood. We also aimed to examine the mediating impact of subjectively experienced ease, but failed to find significant effects. This could be in part attributable to the wording of our question, because some participants in the slow condition may have felt that saying their task felt "difficult" would be strange given that they were provided with ample time for doing it (whereas those in the fast condition might have felt that their task was technically difficult, even if it *felt* easy, because of the rapid processing that it required). Further research is needed to address the role of fluency in thought speed effects.

General Discussion

These experiments suggest that situational manipulations can lead people to experience changes in thought speed. Such manipulations of thought speed influence positive affect. The manipulations used in these experiments included instructions to brainstorm freely, exposure to multiple ideas, encouragement to plagiarize others' ideas, performance of easy cognitive tasks, narration of a video played at high speed, and reading at a rapid pace. These manipulations elicited thoughts ranging in content from ideas for how to make large sums of money, to solutions for simple words problems. By using varied methods for testing the hypothesis that thought speed influences mood, our experiments suggest that this effect does not depend on a single type of thought content or speed-induction procedure. Across six manipulations, participants in the condition designed to induce relatively faster thinking not only reported thinking faster than their peers but also reported more positive affect. The results of Experiments 5 and 6 suggest that these between-condition differences in positive mood are at least partially because of the joy-*enhancing* effects of *fast* thinking.

Across the experiments presented in this article, we report evidence that effects of thought speed on positive affect are partially mediated by participants' subjective experience of that speed. This suggests that the subjective experience of thought speed may play a role in its positive mood effects. Such an account would be consistent with the idea (discussed in the introduction) that people sometimes reflect on their thinking, and those reflections can elicit different feelings depending on the lay theories people possess (e.g., Schwarz, 2005). However, although this mediational evidence is consistent across studies, the evidence indicates fairly weak (and sometimes only marginally significant) mediation. This suggests that though the subjective experience of thought speed may contribute to its positive mood effects, those effects may not be fully accounted for by the metacognitive experience of thought speed. Theoretically, it could be that effects of thought speed are also driven by less reflective processes, such as those mentioned in the introduction of this article (e.g., dopamine activation, processing speed).

Further research is needed to explore more fully the underlying processes that account for thought speed effects. In the present research, we were able to begin an examination of possible underpinnings. Apart from the subjective experience of thought speed, another possibility that we explored (in Experiments 1–3) involved participants' rate of verbal thought production. We found some evidence that participants verbalized thoughts at a faster pace in the fast conditions, but we did not find evidence that those differences in pace mediated effects of experimental condition on positive mood. However, these analyses do not rule out the possibility that objective thought rate contributes to our effects, since our measures were unlikely to have directly tapped into that rate. Another possible account for our results involves whether individuals may have experienced more positive mood in the fast conditions because they were more successful (or *perceived* themselves to be more successful) in those conditions. In five of our six experiments, we were able to examine measures of either real or perceived success (or both), and we found no evidence to support this account. That is, effects of thought speed condition were never mediated by participants' actual success at the task nor by their perceptions about their performance. For example, fast-thinking participants in Experiment 1 actually saw their ideas as being of overall worse quality—and coders shared that perception—and neither self-perceived idea quality nor coders' assessments of idea quality mediated the observed effects.

The focus of these experiments has been on the effects of thought speed on positive mood, and in several of our experiments we looked at positive mood more closely by examining subcomponents of it. These involved feelings of elation, increased energy, creativity and power. Across the four experiments in which we examined these subcomponents, we found evidence for effects of experimental condition on feelings of elation and of creativity. We found significant effects in two of the four experiments for energy (Experiments 1 and 2) and power (Experiments 1 and 3), suggesting the possibility that effects on these two subcomponents may be less strong (or more context-dependent) than effects on the others. Of course, these various measures of positive affect are highly interrelated, and it also may be that effects of thought speed induce a more "generic" positive effect on mood, and one that may not be importantly differentiated according to these subcomponents.

Our studies also examined effects of fast thinking on two other responses: inflated self-esteem/grandiosity, and pressured speech. Our studies provided mixed evidence for effects of thought speed on a standard measure of state self-esteem (three of five experiments found supportive evidence, one found the reverse). They provided more consistent evidence on measures designed to assess clinical grandiosity (two of two experiments found supportive evidence) and involving coders' assessments of grandiosity (two of two experiments found supportive evidence). These collective results may reflect a specific effect of fast thinking on proneness to inflated self-assessment, but they also may reflect a proneness to endorse positive features more generally after fast thinking (e.g., including those features in our positive affect measure). In the case of our measure of pressured speech, which involved whether participants spoke past an experimenter's interruption, both studies that measured it found evidence for it. The results on this measure and on the measures of grandiosity suggest that effects of fast thinking may extend beyond positive mood to responses involving self-assessment (e.g., grandiosity) and behavior (e.g., speech). In further research it will be useful to examine other possible responses elicited by increased thought speed, such as responses involving self-regulation (e.g., goal setting, see Johnson & Carver, 2006).

Finally, it is worth noting that our experiments did not find effects of thought speed on negative mood (with the exception of some marginal effects in our final experiment). This result is consistent with some past research and theory. Work on fluency, for example, has reported effects on positive but not negative mood (Winkielman & Cacioppo, 2001). From the perspective of the inspiration of this work, that is, cases of clinical mania, those cases often involve elevations in positive mood, but not necessarily decreases in negative mood. Indeed, mania often is accompanied by feelings of hostility or anger (e.g., *DSM–IV*, 1994). However, it also is possible that effects of thought speed on negative mood are present and are simply more difficult to detect than effects on positive mood, for example because of the relatively low levels of negative mood reported by our participants.

Mania and Potential Clinical Implications

This research explores a new concept in the field of social psychology: that is, fast thinking. Although this concept is inspired by the psychiatric literature on "racing thoughts" and mania, the current research constitutes the first systematic attempt to conduct a series of experiments manipulating this cognitive process, and examining the psychological consequences of such manipulation. Of course, our results do not come close to approximating the clinical experience of a manic state. However, it is possible that they may be relevant to that state, and we now explore that possibility further.

In the fields of clinical psychology and psychiatry, mania and bipolar disorder ("manic-depression") are typically conceptualized in terms of the mood states associated with them. Major psychiatric disorders are generally categorized as affective disorders, such as mania, or thought disorders, such as schizophrenia. However, the present results suggest exploring the possibility that mania may, at least sometimes, begin with racing thoughts rather than positive mood. This hypothesis is consistent with the results of other research studies which suggest that positive mood is not the first symptom to appear before a manic episode begins in earnest (e.g., Johnson, 2005; Miklowitz & Johnson, 2006). In fact, several studies have found that manic patients identify racing thoughts as one of the most common early signs (along with sleep disturbance) that precede a full manic episode (Lam & Wong, 2005; Molnar, Feeney, & Fava, 1998; Smith & Tarrier, 1992).

Apart from issues of etiology, these findings may hold relevance to the treatment of mania and depression. In an experiment with a normal college population, Pronin and Wegner (2006) found that speeded thinking even of depressive thoughts yielded positive affect. In combination with the present experiments, these findings suggest that manipulations of thought speed may hold promise as one component of treatment for the mood symptoms of affective disorders. Thought speed might be manipulated, perhaps using acute manipulations of the sort described here, to alleviate unwanted mood symptoms. Indeed, some evidence from clinical patients provides support for this possibility. Teasdale and Rezin (1978) instructed depressed participants to repeat aloud one of four letters of the alphabet (A, B, C, or D) presented in random order every 1, 2, or 4 seconds. They found that those participants required to repeat the letters at the fastest rate experienced the most reduction in depressed mood. Over the past several decades, we have observed a cognitive revolution in the treatment of mental illness. This revolution has in large part been inspired by Aaron Beck's pioneering idea that mental illness, particularly depression and anxiety, can be perpetuated by the contents of our cognition, involving "maladaptive schemata, automatic thoughts, and biased interpretations" (Clark & Beck, 1989, p. 382; also Abramson, Seligman, & Teasdale, 1978; Beck, 1976; Beck & Emery, 1985). The present research suggests the possibility that it may not only be the contents of our cognition that can be intervened with to improve the symptoms of mental illness, but also the speed of that cognition.

On a related note, these findings also provide a novel hypothesis about the mechanisms underlying the mood-enhancing effects of certain everyday activities such as drinking coffee, and engaging in aerobic exercise. These activities are proven mood lifters, and they have been shown to induce faster thinking. The present findings suggest the possibility, one that requires further research, that the positive effects of some of these experiences may at times occur by way of their impact on thought speed. These findings suggest that experiences that can succeed in making us think fast may have desirable consequences for affect (and, perhaps, for energy and self-confidence). In a world where we often could use an extra boost to our mood, simple manipulations of thought speed may have valuable practical importance.

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(*Appendix follows*)

Appendix

Table of Measures Used in Each Experiment, in Their Order of Presentation

Experiment	Measures
Experiment 1: Brainstorming	1. Felt thought speed
	2. Positive and Negative Affect (*modified PANAS**)
	3. State Self-Esteem scale
	4. Behavior Identification Form
	5. Self-rating of "good ideas" (*from participant notes*†)
	6. Coders' ratings of idea quality (*from participant notes*)
Experiment 2: Idea exposure	1. Felt thought speed
	2. Positive and Negative Affect (*modified PANAS*)
	3. New items: friendly, attractive, dating, distracted
	4. State Self-Esteem Scale
	5. Behavior Identification Form
	6. Pressured speech (*from participant recording*)
	7. Coded grandiosity (*from participant recording*)
Experiment 3: Plagiarism	1. Felt thought speed
	2. Positive and negative affect (*modified PANAS*)
	3. State Self-Esteem scale
	4. Behavior Identification Form
	5. State-Trait Grandiosity scale
	6. Pressured speech (*from participant recording*)
	7. Coded grandiosity (*from participant recording*)
Experiment 4: Task ease	1. Felt thought speed
	2. Positive Affect (*modified PANAS*)
	3. State-Trait Grandiosity scale
	4. State Self-Esteem scale
Experiment 5: Watching in fast forward	1. Felt thought speed
	2. Positive and Negative Affect (*PANAS*)
	3. Written description of clip
Experiment 6: Reading aloud	1. Positive and Negative Affect (*PANAS; at pretest*)
	2. Felt thought speed
	3. Felt ease versus difficulty
	4. Positive and Negative Affect (*PANAS; at posttest*)
	5. State Self-Esteem scale

* The modified PANAS for assessing positive affect included additional items (*happy*, *creative*, *powerful*, *tired* [reverse-scored], *insightful*), and for negative affect it included a subset of items (*distressed*, *hostile*, *jittery*, *irritable*).
† Items indicating "from participant notes" (or "recording") derive from analysis of participants' hand-written notes (or taped speech) and thus were not assessed in the questionnaire packet.

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