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Increasing and Decreasing Motor and Cognitive Output: A Model of General Action and Inaction Goals

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Abstract

General action and inaction goals can influence the amount of motor or cognitive output irrespective of the type of behavior in question, with the same stimuli producing trivial and important motor and cognitive manifestations normally viewed as parts of different systems. A series of experiments examined the effects of instilling general action and inaction goals using word primes, such as "action" and "rest." The first 5 experiments showed that the same stimuli influenced motor output, such as doodling on a piece of paper and eating, as well as cognitive output, such as recall and problem solving. The last 2 experiments supported the prediction that these diverse effects can result from the instigation of general action and inaction goals. Specifically, these last 2 studies confirmed that participants were motivated to achieve active or inactive states and that attaining them decreased the effects of the primes on behavior.

Keywords

action goals; self-regulation; behavior

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The cognitive control of behavior is a socially successful way to steer individuals into efficacious specific behavior that is beneficial for themselves and their groups. Socially valued concepts can become linked to socially appropriate behaviors that are automatically elicited from a reminder of the concept or a goal linked to that concept (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001). For example, people who are incidentally reminded of "success" enact competitive behaviors because these specific behaviors are tightly linked to the concept (Bargh et al., 2001). In addition to these specific behavioral effects of cognitive concepts, evolutionary and motivational considerations suggest a different modality of cognitive control, one that regulates general action versus inaction independently of what specific behaviors unfold.

General action can be defined as motor and/or cognitive output and *general inaction* as the lack of action. Action and inaction are of course not dichotomous entities but rather two ends of a continuum of activity. Intense and/or frequent motor and cognitive processes constitute the action end, whereas non-REM sleep exemplifies the inaction end with neither motor output (e.g., leg movement) nor cognitive output (e.g., dreaming). Given this definition, the action end can include not only important, well-planned, effortful behaviors, such as acquiring knowledge, but also seemingly more senseless behaviors, such as doodling, as well as relatively effortless behavior, such as eating when food is present. In other words, general action encompasses motor and/or cognitive output and unifies a wide variety of behaviors that may be driven by different goals. Whereas acquiring knowledge and doodling during a lecture may be respectively driven by the goals to achieve a good grade versus to entertain oneself, respectively, both acquiring knowledge and doodling are identical from a general action perspective.

The regulation of general activity undoubtedly owes to biological–dispositional factors, such as metabolic levels (Lawrence, Thongprasert, & Durnin, 1988), processing speed (Anderson, 1992), or the genetic bases of bipolar disorder (Baum et al., 2008). There are also likely social factors. Somewhat surprisingly, however, social psychology has paid little attention to processes underlying general activity levels. Instead, social psychology has concentrated on predicting, changing, and priming *specific* motor or cognitive behaviors, such as increasing seatbelt use (e.g., Ajzen & Fishbein, 2005) or reducing prejudiced responses to other people (see Fiske & Taylor, 1991). As a result, there has been no theoretical exploration of the processes underlying action and inaction.

This article addresses the possibility of a goal-mediated regulation of activity level, with a disregard for the type of activity that is regulated. General action and inaction goals are goals with end states at the extremes of the continuum of activity level (either high or low motor and cognitive output). When set, these goals can trigger a search for available and subjectively relevant means to reach these end states of high or low activity. That is, just as with the satisfaction of more specific goals, the satisfaction of general goals should proceed through the identification of available and appropriate courses of action that can satisfy the goal (Bargh et al., 2001; Kruglanski et al., 2002; Moskowitz, Li, & Kirk, 2004). Both action and inaction goals imply commitment of effort toward the desired end state and should operate like other goals (cf. Wright & Brehm, 1989).

Although general action and inaction goals are purported to operate in ways similar to more specific goals, this conceptualization goes beyond current knowledge about human behavior. For example, in the domain of individual differences, locomotion is defined as the tendency to engage in goal-directed behavior and movement and is supposed to be orthogonal to assessment (i.e., the tendency to analyze and think deeply about any situation; Kruglanski et al., 2000). Likewise, past research has shown that certain decisions involve brain pathways that are independent of the type of motor behavior that is executed (Heekeren, Marrett, Ruff, Bandettini, & Ungerleider, 2006). In this context, our model offers a way in which both motor and cognitive activity (e.g., locomotion and assessment) can obey the same principle. As another example, goals have been insightfully described as systems (Bandura, 1989; Kruglanski et al., 2002; Pervin, 1983; Powers, 1973, 1978), but no theoretical or empirical work has been previously conducted on goals that influence activity level. General action and inaction goals may trigger behaviors typically construed as part of different systems (e.g., an achievement goal system from an affiliation goal system or a dietary goal system).

In this article, we primed participants with words related to general action (e.g., “go,” “active”) or inaction (e.g., “rest,” “stop”). The experimental situations were designed so that participants had to either choose between a discreet active choice (e.g., doodling or making a paper airplane) versus an inactive choice (i.e., putting one’s head down for rest) or could choose to display a continuous behavior indicative of motor or cognitive output (e.g., the number of consumed food items or the amount of knowledge resulting from reading a text). Given a single focal way of satisfying action or inaction goals, our model’s prediction was straightforward. Specifically, action priming should lead to choosing a more active task and should cause more motor or cognitive output (e.g., choice of doodling on a piece of paper vs. rest, more learning vs. less learning) than inaction priming would. Goal mediation was assessed in subsequent experiments by examining, for example, whether activities that should satisfy general action and inaction goals reduce the behavioral effects of these primes (Marsh, Hicks, & Bink, 1998). This pattern should not emerge if participants are simply executing prime-consistent behavioral procedures but are not motivated by, and thus remain insensitive to, the outcomes of their choices.

Understanding the effects of general action and inaction goals is important for various theoretical and practical reasons. First, our hypothesis implies that people control engaging in behavior that leads to motor or cognitive output before they control the quality or type of output. The usual tenet is that people strive to perform useful or desirable activity (e.g., Fishbein & Ajzen, 1975), not just activity. Second, an interesting aspect is that these goals allow for top-down influences on both trivial behaviors, such as doodling during a lecture, as well as learning the presented material. Whereas conscientious and impulsive behaviors are seen as antagonistic phenomena (Barratt, 1985), we propose a mechanism that can produce both. Third, whereas inaction is normally seen as a failure to act (Roese, Hur, & Pennington, 1999), our model suggests that inaction can be an end state that people pursue. Last, evidence that these goals exist may be important in the context of goal and behavior research. Action and inaction goals, for example, may increase the likelihood of pursuing other goals that are of interest to researchers (D. C. McClelland, Atkinson, Clark, & Lowell, 1953) and fit well within the hierarchical view (Bandura, 1989; Kruglanski et al., 2002; Pervin, 1983; Powers, 1973, 1978).

EFFECTS OF GENERAL ACTION AND INACTION CONCEPTS AND POSSIBLE GOAL MEDIATION

If general action and inaction goals are plausible, using general action and inaction words as primes should influence physical and mental activities of various kinds. Therefore, one way of demonstrating these goals’ existence is to show effects of general action and inaction words on diverse activities. This demonstration requires first presenting word primes and then allowing individuals to link their primed goals to the concrete behaviors that are central to the study. For example, individuals may be offered opportunities to either rest or perform a task. As the tasks map onto culturally defined means of action and inaction, the action prime may trigger high motor or cognitive output, whereas the inaction prime may trigger rest. That is, people who are primed with general action may choose an active task, whereas people primed with inaction may choose rest. By the same token, relative to general inaction goals, general action goals may yield more eating, finer segmentation of an observed behavior, higher recall of a text, and more effective problem solving. In other words, motor and cognitive output may be greater when general action rather than general inaction concepts are primed.

Importantly, action and inaction goals should have goal properties, involving but going beyond mere concept activation. First, goals are outcome driven; they are about *maximizing action or inaction.* In many conditions, the behaviors that lead to the goal's end state are likely to be as active or inactive as the end state is. For example, satisfying action goals may entail simply selecting more active behaviors (leading to more motor or cognitive output). Correspondingly, satisfying inaction goals may entail simply selecting more inactive behaviors. Nevertheless, other situations are possible. If indeed goals are at stake, behaviors should be selected to achieve an overall outcome regardless of the active or inactive quality of the intervening behaviors. As a result, a long active end state could be potentially achieved through an inactive mean and a long inactive end state could be potentially achieved through an active mean. For instance, one may rapidly solve a problem now in order to sleep for an extended time afterward or briefly sleep now in order to solve a problem for an extended time afterward. If the outcomes are motivating, action goals will trigger the search for the longest active outcome even if the means are inactive. Likewise, inaction goals may trigger a search for the longest inactive outcome even if the immediate means are active. In contrast, if what triggers activity/inactivity is simply a procedure rather than a goal, immediate concept-consistent behavior may emerge irrespective of the ultimate amount of activity.

Second, the behavioral effects of the goals on motor and cognitive output should be stronger before the goal is satisfied than they are after the goal is satisfied (Atkinson & Birch, 1970; Ferguson & Bargh, 2004; Förster, Liberman, & Higgins, 2005; Kawada, Oettingen, Gollwitzer, & Bargh, 2004; Lewin, 1935; Marsh et al., 1998; Zeigarnik, 1967). For example, action goals should yield more overall active behavior provided that no prior activity has satisfied the goal. Likewise, inaction goals should yield less overall active behavior provided that no prior inactive behavior has satisfied the goal. Following a satisfaction opportunity, however, these effects should decrease and may even reverse.

We suggest that action and inaction goals are likely to exist as a natural consequence of evolutionary pressures (for an analysis of evolutionary pressures on cognition, see Pinkerton, 1997). Upon encountering new situations, for example, mere activity can introduce solutions and generate knowledge in ways that are not facilitated by specific forms of cognitive control (for a discussion of flexibility, see Kruglanski et al., 2000). Eventually, a useful activity may develop that reduces the need for generalized activity and allows for refocusing on specific behaviors. Further, when one specific course of action fails, there are advantages to taking a general approach to the problem ("I need to do something, but what?"). Many solutions derive from the ability to reconsider all possible motor and cognitive processes rather than insisting on specific behaviors that have led to failure in the past.

General inaction goals may also offer advantages. To begin with, conserving energy is important for survival. As a result, successful adaptation to the environment may require a mechanism to conserve energy by allowing certain symbols or social stimuli to trigger cessation of activity. Furthermore, there may be positive influences of inaction on problem solving. For example, when all courses of action fail, awaiting environmental input may be the best solution. In this way, concepts linked to general inaction may prevent hopeless action while an appropriate behavior is identified. As another example, the absence of immediate action during the U.S. Cuban missile crisis (The Avalon Project, 2007) produced better outcomes than those that were expected from a more active response.

THE PRESENT ARTICLE

The procedures used to prime goals in recent years (e.g., Bargh & Chartrand, 1999; Bargh et al., 2001; Moskowitz et al., 2004) seemed ideal to study general action and inaction goals. As general action goals presumably influence a variety of behaviors, incidental exposure to the word “action” may stimulate high frequency of behaviors with motor and/or cognitive output. In contrast, incidental exposure to the word “inaction” may stimulate people to rest and to be less active, even when active behaviors are situationally required (e.g., as part of the experimental procedures). Correspondingly, the word “rest” may decrease behaviors yielding high motor or cognitive output across a variety of situations.

We used words like “action” and “go” versus “rest” and “stop” as part of word completion tasks, detection of stimuli presented on the screen tasks, or scrambled sentences tasks. In Experiments 1, 2, and 3, general action primes were hypothesized to yield processes conducive to more motor output to a greater extent than inaction primes were. In Experiment 1, previously primed participants were told that they would have a break during which they could choose to fold or doodle on a piece of paper or to close their eyes and rest. Based on our hypotheses of more motor output in response to action rather than inaction concepts, the action primes should elicit higher proportion of folding/doodling than the inaction primes should, whereas the inaction primes should elicit a higher proportion of rest than the action primes should. In Experiment 2, word primes of action or inaction were followed by an opportunity to eat grapes that were presented to the study participants. Given that eating is a process involving motor output (e.g., delivering hand to mouth and chewing), we hypothesized that action primes would yield more eating than inaction primes would. In Experiment 3, previously primed participants watched a video of a college student performing a series of daily activities, such as checking e-mail and having a drink (Ratcliff et al., 2004). The participants’ task was to watch the video and to press the computer space bar to divide the video into as many units of meaningful behavior as they identified. The number of presses was expected to be higher after action primes than after inaction primes.

Experiments 4 and 5 were designed to demonstrate effects of the primes on two cognitive activities, with the expectations of more recall and problem solving in action-prime conditions rather than inaction-prime conditions. In Experiment 4, we used brief supra-liminal exposures (50 ms) to action versus inaction words and then asked participants to study a passage about evolutionary psychology. Correct recall of the material afterward was expected to be higher after action primes than after inaction primes. In Experiment 5, participants first received the primes and then received verbal and math problems to solve. Given higher cognitive output, we expected a higher number of correctly solved problems when the prime was action than when the prime was inaction.

The last two experiments of our series were designed to validate the assumptions that goals may mediate the effects of general action and inaction words. In Experiment 6, participants first completed word fragments that included either action or inaction completions. Similar to the earlier experiments, half of the participants (control condition) chose to rest or work on an intellectual problem for 30 s. The other half (experimental condition) of the participants chose either 30 s of rest followed by 3 min of solving verbal or math problems or 30 s of problem-solving followed by 3 min of rest. The outcome variable was the dichotomous immediate choice, which should be prime consistent in the control condition but prime inconsistent in the experimental condition.

In Experiment 7, we primed participants with action, control, or inaction words and then introduced an intermediate task that was either active or inactive. The task could be either doodling on/folding an available piece of paper or resting for 2 min. Following the intermediate task, participants read a text about vegetarianism and listed their thoughts about what they read. The number of listed thoughts was used as a measure of motor/cognitive activity and should be greater when action goals are operating. Thus, unsatisfied action goals should produce a greater number of thoughts than unsatisfied inaction goals would. Importantly, however, these effects should be attenuated or even reversed when the preceding task had the potential to satisfy the primed goals.

EXPERIMENTS 1, 2, AND 3: MOTOR OUTPUT

Experiment 1: Folding Paper Airplanes/Doodling Versus Resting

Overview—In this experiment, participants first completed several word fragments to form a word. For about half of these participants, several of the completed words related to action. For the other half, the words related to inaction. Next, participants were asked to clear their minds by choosing either to fold or doodle on a piece of paper (active task) or to simply relax (inactive task). We predicted that participants primed with action would be more likely to choose the active, whereas participants primed with rest would be more likely to choose the inactive behavior. Importantly, the primes should produce these patterns of behavior because they activate action and inaction concepts and possibly concept-related goals. Therefore, prior to this experiment, we obtained evidence about concept activation using a lexical decision task. In another pretest, measures of mood were included to rule out the possibility that the primes had effects on positive and negative feelings.

Method

Participants and Design: Ninety-eight male and female students attending the University of Florida participated in this experiment in return for partial course credit. Participants were randomly assigned to either an action-prime condition or an inaction-prime condition. The design was a two-cell between-subjects design. There were also two pretests performed on independent study samples.

Experimental Procedures: Participants were first told that they would complete several tasks within their experimental session. The first of these tasks ostensibly measured verbal ability and was designed to prime participants with an action or an inaction concept. After the priming, participants were given an actual choice between an active and inactive task. The choice was followed by several filler tasks.

Action and inaction primes: In the beginning of this experiment, we explained that we needed to administer a quick measure of verbal ability. Participants were asked to complete 20 words, 8 of which connoted either "action" or "inaction." Depending on random allocation, half of the participants received 8 incomplete rest-related words that could be completed as "still," "pause," "interrupt," "calm," "freeze," "unable," "stop," and "paralyze," whereas the other half received 8 action-related words that could be completed as "motivation," "doing," "behavior," "engage," "action," "make," "go," and "active." Most of these words had high associations with "action" and "rest" in the (empirically derived) Computerized Edinburgh Associative Thesaurus (Kiss, Armstrong, Milroy, & Piper, 1973). Some critical pretests for the concept activation and potential effects on mood are detailed presently.

Choice of tasks: After completing the priming task, participants were told to clear their minds before proceeding to other tasks. With this ostensible purpose, participants were given 2 min of rest for which they could choose one of two tasks. Specifically, participants read the following:

> We will now give you two minutes to clear your mind. During this time, you should either: 1) remain seated and close your eyes for two minutes. During this time you should try to calmly relax and clear your mind, give your brain a break, or 2) do something with the scrap piece of paper you see at your computer station for two minutes. During this time you can doodle on the paper, fold it, or even make something like a paper airplane.

The order of presentation of the active and inactive options was counterbalanced. After making their choice, participants learned that the computer would automatically proceed to the next screen after the 2 min had elapsed. After the 2-min period, participants were asked, “Did you remain seated with your eyes closed or did you do something with the piece of paper?,” and they responded by checking the box for either the number 1 (*I sat with my eyes closed*) or 2 (*I did something with the paper*). These responses were verified by observation on the part of a research assistant.

Pretesting: Two independent groups of 60 and 35 (men and women, respectively) participants were used to determine whether the word primes produced corresponding concept activation and to rule out possible mood effects. These participants were primed with action and inaction as in the main study.

Concept activation check: Following the word-completion manipulation, the first pretest (N = 60) entailed a lexical decision task in which 10 action words shown in the priming task (e.g., “active,” “go,” “move,” and “behavior”), 10 action words not shown in the priming task (e.g., “run,” “jump,” “hit,” and “build”), 10 previously shown inaction words (e.g., “stop,” “calm,” “freeze,” and “relax”), and 10 not-previously-shown inaction words (e.g., “dormant,” “sleep,” “rest,” and “serene”) were presented along with corresponding sets of 10 filler words (e.g., “day,” “wall,” “sponge,” and “lemonade”). The fillers were matched in word frequency, word length, and number of syllables to their respective critical words. A total of 60 nonwords (e.g., “bitavior,” “mobe,” srod,” and “cilt”) were also included.

The lexical decision task consisted of 10 critical blocks with six words from each word category and six nonwords per block. Before the critical blocks, one block of practice trials was run containing six neutral words (e.g., “television,” “apple,” and “this”) and six nonwords. Half of the participants were instructed to press the “9” key on the keyboard if they thought the stimulus on the screen was a word. Correspondingly, they were instructed to push the “1” key on the keyboard if they thought that the stimulus was a nonword. For the other half of the participants, the correspondence of the keys and words/nonwords was switched. (Order did not make a difference.) The participants were instructed to respond as quickly and accurately as possible.

Reaction times greater than 3,000 ms and less than 100 ms were trimmed, and words not correctly completed (over all words: M = 2.30%, SD = 2.34%, incorrect completions) were set as missing values (Bargh & Chartrand, 2000). Then, means and standard deviations of reaction times of all the words were calculated for each participant. The responses greater than 2.5 standard deviations from the mean for each participant were excluded (Bargh & Chartrand, 2000). After that, reaction times for each word set were averaged (Bargh & Chartrand, 2000).

Checks for mood effects: A separate group of students (N = 35) underwent the same manipulation procedures as the main study and then reported their affective feelings. Specifically, after the word-completion task, participants used 1 to 11 scales to indicate whether they felt *good* versus *bad*, *disappointed* versus *satisfied*, *sad* versus *happy*, and *displeased* versus *pleased*. Responses to these four scales were used as an index of feelings valence (α = .97).

Results

Pretests of Effects of Word Primes: The pretests were conducted to verify that the primes produced corresponding concept activation without altering participants' mood. Each test is described in turn.

Concept activation: We first analyzed the mean time to respond to action, inaction, and filler words as a function of primes using an analysis of variance (ANOVA).[1] These analyses indicated that action primes yielded faster responses than inaction primes did for all types of words (for action vs. inaction primes, respectively: action words, M = 562.74, SD = 62.74 vs. M = 623.81, SD = 144.15; action-word-corresponding fillers, M = 578.94, SD = 72.02 vs. M = 628.83, SD = 135.27; inaction words, M = 595.18, SD = 63.53 vs. M = 628.77, SD = 145.76; inaction-word-corresponding fillers, M = 594.38, SD = 67.64 vs. M = 652.26, SD = 157.13). Given these generalized effects of the primes on response speed, the proper comparisons entail corrected response times, which were obtained after subtracting either action or inaction words from their corresponding matched fillers. Positive numbers in each case indicate that the reaction times for the action or inaction targets were faster (i.e., more activation) than the ones for fillers were, a zero indicates no difference, and negative numbers suggest greater difficulty for targets than for fillers.

The corrected action versus the corrected inaction indexes were analyzed using an ANOVA with type-of-word index as a within-subjects factor and prime (action vs. inaction) as a between-subjects factor. As one might expect if the primes elicit opposing concepts, there was a significant interaction between type-of-word index and prime, $F(1, 58) = 4.05$, $p = .04$. The direction of the index of activation of action words was higher in action-prime conditions than in inaction-prime conditions (M = 16.20, SD = 36.40, and M = 5.02, SD = 47.76, respectively), p for contrast = .31. Correspondingly, the direction of the index of activation of inaction words was higher in inaction-prime conditions than in action-prime conditions (M = 23.49, SD = 54.74, and M = −0.80, SD = 42.66, respectively), p for contrast = .06. The absolute effect sizes corresponding to each contrast did not differ significantly from each other and in combination reached the significance indicated by the interaction. These results suggest that action primes activated action concepts more than they did inaction concepts, whereas inaction primes activated inaction concepts more than they did action concepts.

Feelings: With respect to effects on feelings, mood was not affected by the manipulation. Specifically, participants felt similarly positive feelings in action and inaction conditions (M = 8.18, SD = 1.88 vs. M = 7.66, SD = 2.85, respectively), $F(1, 33) = 0.41$, *ns*. Mood was also measured in several of the subsequent studies with similarly null results, which are not presented for the sake of brevity. In combination with the lexical decision task data, these null effects render confidence in the possibility of concept activation without associated differences in feeling valence.

Effects on Active Versus Inactive Choices: The analysis of participants' behavior in Experiment 1 was consistent with predictions. Participants who received the action prime were more likely to choose the active task (62%, N = 33) than they were the inactive task

[1]An additional analysis showed no main effect or interactions for the use of words that were previously shown as primes and words not previously shown. This finding suggests that the concept activation was strong.

(38%, $N = 20$). In contrast, participants who received the inaction prime were more likely to choose the inactive task (64%, $N = 29$) than they were the active task (36%, $N = 16$). According to a kappa statistic, the association between the action/inaction prime and the dichotomous behavioral measure was statistically significant, $\kappa(1, 98) = .27$, $p = .008$.

Discussion—The data from Experiment 1 supported the hypothesis that subtly manipulated general action and inaction concepts can yield choices with relatively more and less motor output without producing differences in affective feelings. This pattern is consistent with the possibility that action and inaction goals influence motor output. To gain further support for our hypothesis, a second experiment was conducted using a different paradigm that can also capture processes with overt motor output. This second study also included a check for suspicion to rule out experimental demand effects. Later studies validated the goal mediation interpretation of our findings.

Experiment 2: Eating Behavior

Overview—The purpose of Experiment 2 was to test whether action and inaction concepts correspondingly increase or decrease the amount of motor output associated with eating. The first task was the word-completion task used in the first experiment. Then, participants were given a chance to sample some grapes from a bowl brought to their computer station.

Method

Participants and Design: We recruited 38 undergraduate students at the University of Florida to participate in the study in exchange for credits in an introductory psychology course. A two-cell (prime: action vs. inaction) between-subjects design was employed.

Procedures and Dependent Measure: Participants in this study first completed a series of word strings similar to the ones in the first study. Next, participants were told that they would have an opportunity to sample grapes that have been kept fresh in a new type of plastic container. After that, the research assistant presented the participant with a Styrofoam bowl containing 15 red grapes. The dependent measure in this study was the number of grapes eaten, which was obtained by asking participants at the very end of the experiment, before the debriefing, “How many grapes are left in your bowl?” Research assistants also counted the number of grapes remaining at the end of the session to verify participants’ responses. Furthermore, at the end of the study, several questions probing for suspicion and experimental demand were included. Specifically, participants were asked (a) “what was the purpose of the experiment?,” (b) “do you think any tasks were related?,” (c) “do you think any earlier task affected your eating?,” and (d) “did you notice anything about the experiment that seemed strange?” Responses were coded for suspicion and awareness of the hypothesis.

Results and Discussion: The number of grapes participants ate was analyzed as a function of prime. As predicted, however, those primed with action ate more than those primed with inaction ($M = 13.11$, $SD = 3.31$ vs. $M = 9.28$, $SD = 4.74$). This predicted pattern was statistically significant, $F(1, 36) = 8.18$, $p = .007$, and consistent with the hypothesis that action and inaction goals affect motor output. Importantly, no participant manifested suspicion or guessed the study hypothesis, thus increasing confidence in the subtlety of our manipulation. Similar checks in subsequent studies also revealed no awareness of the experimental hypothesis.

In sum, Experiment 2 confirmed our hypothesis that priming participants with action concepts would produce more motor eating behavior. Experiment 3 investigated segmentation of an observed behavioral sequence reflected in segmentation/space-bar pressing. We expected more frequent segmentation/space-bar pressing following action primes than following inaction primes. This experiment also included a control-prime condition.

Experiment 3: Space-Bar Pressing to Segment Behavior

Overview—In Experiment 3, we expected that segmenting observed behavior would be contingent on the priming of action or inaction. Behavioral-segmentation output was measured by the number of times participants pressed the space bar on the computer keyboard while watching the videotaped behavior of another person. Specifically, participants were primed with action, inaction, or neutral words, and then watched and segmented a 3-min long video of a student performing some mundane behaviors in a dormitory.

We predicted that participants initially primed with action concepts would produce more behavioral segments than would participants who received inaction concepts. A growing body of work within the person-perception literature has shown that more effortful cognitive processing of a person's behavior yields greater number of produced segments (e.g., Handley & Lassiter, 2002; Lassiter, Briggs, & Bowman, 1991; Lassiter, Geers, & Apple, 2002; Lassiter, Stone, & Rogers, 1988). Although behavioral segmentation can be considered a measure of both motor and cognitive output, space-bar pressing comprises a precise measure of motor behavior. The following two experiments, however, included cognitive performance as a direct measure of cognitive output.

The behavior of the control participants was expected to fall somewhere in between the action and inaction conditions. That is, the relative placement of the control should depend on the baseline level of activity of participants in a given study, and may vary with a number of factors (e.g., time of day, time of the semester, weather). Importantly, however, the control condition should be neither less active than the inaction-prime condition nor more active than the action-prime conditions. Otherwise, the primes could not be construed as eliciting behavior at the extremes of the activity continuum.

Method

Participants and Design: One hundred eighty-six male and female students attending the University of Florida participated in this experiment in return for partial course credit. Participants were randomly assigned to action-, inaction-, or control-prime conditions.

Procedure: Participants were primed with action or inaction using the same procedures as in Experiment 1. However, Experiment 3 further included a control task containing eight word fragments that could be completed as words unrelated to either action or inaction (e.g., "pear"). After completing the priming task, participants were informed that they would watch a short silent video as part of a study on person perception. They were asked to identify any meaningful behavior in the video and received examples of meaningful behaviors (see Ratcliff et al., 2004). An example illustrated various ways to segment the behaviors enacted by an individual reading instructions to a participant. Specifically, the participant might identify many behaviors, such as the individual standing in front of the participant, reading instructions, talking out loud, making eye contact and other gestures, listening to the participant, and answering the participant's questions. Or, the participant might identify fewer behaviors, such as noting that the individual is standing, reading out loud, and responding, or even only that the individual is communicating instructions. The instructions then stressed that the participants should identify whatever behaviors seemed natural and meaningful to them and that there was no right or wrong way of completing this task. After this clarification, participants were asked to press the space bar of the computer every time they identified a meaningful behavior in the upcoming video.

Participants then watched a 3-min video of a Caucasian male in his early 20s engaging in mundane activities, such as drinking a beer, working on his computer, and sifting through papers on his desk. The computer recorded the number of times each participant pressed the space bar while watching the video. This tally served as our dependent measure, with greater number of units indicating more output or active behavior. As mentioned before, this measure should detect motor pressing of the space bar, in addition to perhaps cognitive thought about the observed behaviors.

Results and Discussion: Three participants identified no meaningful behaviors from the video and 5 other participants segmented the behavior sequence at a rate of 3 standard deviations above the mean for this measure. Therefore, the data from these individuals were removed from the below analyses, even though this procedure did not significantly alter the results. The reported results are based on data from 178 participants.

The number of meaningful behaviors identified by participants was analyzed as a function of prime (action, control, or inaction) using an ANOVA. The means corresponding to this analysis indicate that action primes ($M = 35.85$, $SD = 24.98$) led to identifying more behaviors than did either control ($M = 29.02$, $SD = 18.85$) or inaction primes ($M = 26.67$, $SD = 15.99$). Moreover, the mean of the control prime fell in between the action and inaction primes. This pattern of means was supported by a significant effect of the primes, $F(2, 175) = 3.28$, $p = .04$. In addition, participants primed with action identified significantly more behaviors than did either participants primed with inaction or participants in the control condition (p for contrasts = .02 in each case). Finally, participants in the inaction and control conditions did not significantly differ in the number of identified behavioral units (p for contrast = .48). In sum, the study confirmed that the effects of the primes mapped onto action and inaction rather than producing two different effects falling both above or both below the baseline level of activity. Although in this study the difference between control and inaction primes was nonsignificant, a later study produced a significant difference between control and inaction primes.

In conclusion, this study demonstrated that action (vs. inaction) primes yield a larger number of presses to segment observed behavior. Thus, these data lend further support to our argument that general action and inaction concepts can trigger various forms of activity. In addition, the study showed that the action primes produced states that were more active than the control condition did. Importantly, however, the inaction-prime condition did not differ significantly from the control condition. This finding may imply that the baseline level was fairly inactive to begin with but suggests the need for further data comparing inaction and control primes. Thus, we tackle this issue later in Experiment 6.

EXPERIMENTS 4 AND 5: COGNITIVE OUTPUT

Experiment 4: Text Recall

Overview—Experiment 4 investigated the association between general action/inaction primes and processes with strictly cognitive output. Specifically, the purpose was to determine whether action concepts promote greater recall of written material than inaction concepts do. In this study, participants first received an ostensible reaction-speed test. In reality, this test contained briefly presented supra-liminal action or inaction primes. After the test, participants read an informational passage about dominance hierarchies in different types of societies. After reading this material, they completed a test assessing their recall of the information contained in the passage.

Method

Participants and Design: Thirty-seven female and male undergraduate students at the University of Florida participated in exchange for credits in an introductory psychology course. A two-cell (prime: inaction vs. action) between-subjects design was employed.

Procedures: Under the pretense of a reaction-speed test, participants were first primed with action versus inaction goals. Following this priming task, participants were asked to quietly study a text for 6 min. Immediately after the presentation of this passage, participants answered nine open-ended questions about the material. The coded correctness of the answers was used to determine the effects of action versus inaction concepts on amount of recall.

Materials and Measures

Priming task: The action or inaction goals were primed using a 16-item priming task. Specifically, each of the primes was presented on the center of the screen for 50 ms following a string of "&&&&&&" (presented 100 ms before the prime), which functioned as a fixation point, and then followed by "XXXXXX" (presented after the prime was on the screen for 50 ms). The participants' task was to press the space bar on the keyboard as quickly as possible when "XXXXXX" appeared on the screen. When participants pressed the space bar, another priming sequence began. Two variants of this task were constructed, one to prime general action and the other to prime general inaction. The primes and fillers used in these tasks were the same as those used in Experiment 1. After the task was complete, all participants read "You did a good job, congratulations!" regardless of their actual reaction times.

Educational passage on evolutionary psychology: We used a 771-word passage extracted from an evolutionary psychology book. This passage described the history and development of human dominance hierarchies. The material was presented to participants sentence by sentence with a 15-s break between each. Participants were instructed to think about the passage while reading it quietly.

Dependent measures: A set of nine open-ended questions was used to assess participants' recall of the material. Two independent raters coded each question in terms of correctness (interrater kappa > .93). For example, the passage argued that modern humans, like other primate species, form stable dominance hierarchies that have been observed among preschool children, human adolescents, and adults in prison. Correspondingly, the first question asked, "What groups were observed to verify this?" The correct answer was "human preschool children, human adolescents, and adults in prison." Answers that failed to mention any of the three groups were coded as 0 (*incorrect*) whereas answers that correctly identified at least one group were coded as 1 (*correct*). An overall index of correctness was computed by obtaining the proportion of correct responses out of nine questions. Higher numbers in this index indicated higher recall of the material.

Results and Discussion—The means of correctness were analyzed as a function of prime (inaction vs. action) using an ANOVA. As expected, recipients of action primes responded with more correct answers than did recipients of inaction primes (M of proportions = 0.58, $SD = 0.11$ vs. $M = 0.45$, $SD = 0.21$, respectively), $F(1, 35) = 5.55$, $p = .03$. Thus, this experiment verified that action and inaction primes influence levels of cognitive activities, extending the previous findings beyond effects on motor behavior. These effects are consistent with the possible activation of general action and inaction goals and were conceptually replicated in Experiment 5.

Experiment 5: Number of Solved Problems

Overview—In this experiment, participants arranged previously scrambled sentences that contained a high proportion of words related to either action or inaction. Following a brief preparation period, participants were told to do their best and proceeded to complete verbal and math problems. We anticipated that action priming would yield more correct solutions relative to inaction priming.

Method

Participants and Design: Participants were 36 students from introductory psychology classes at the University of Florida who participated in exchange for credit. The design was a two-cell (prime: action or inaction) between-participants design with number of solved problems as the main dependent variable.

Experimental Procedures

Priming task: Action or inaction was primed using a scrambled-sentence task. Participants were told that the experimenters were pilot testing an instrument to assess how people form sentences. In this task, participants rearranged four of five words to make a coherent sentence. Participants were given 12 scrambled sentences, 8 of which contained action-related words (e.g., book, *action*, is, the, fictional) or inaction-related words (e.g., the, tells, *inaction*, watch, time). The other 4 sentences contained control fillers (e.g., shoes, feet, *green*, cover, your). Participants performed this task on the computer and had an unlimited amount of time to complete it. The primes were never part of the sentence to be unscrambled.

Performance measure: After the priming, participants were asked to think about how they would approach upcoming SAT-type problems and were then presented with the first problem on the computer. All participants completed 21 questions that assessed verbal ability (antonyms, sentence completion, and analogies) and quantitative ability (solving word problems and algebraic equations). An example of these problems follows (correct answer is italicized):

COLOR: SPECTRUM:

A. TONE: SCALE,

B. SOUND: WAVES,

C. VERSE: POEM,

D. DIMENSION: SPACE,

E. CELL: ORGANISM.

Results and Discussion—The number of correctly solved problems was submitted to an ANOVA with prime as the independent variable. The analysis revealed a main effect of prime on number of solved problems, $F(1, 34) = 5.68$, $p = .02$, demonstrating that participants primed with action performed better than participants primed with inaction did ($M = 12.83$, $SD = 1.86$ vs. $M = 10.78$, $SD = 3.15$, respectively). Thus, this study confirmed that action and inaction primes produced, respectively, higher and lower levels of cognitive output, as might be expected from the activation of action and inaction goals.

EXPERIMENTS 6 AND 7: GOAL PROPERTIES

Experiment 6: Outcome Sensitivity

Overview—Experiments 1–5 established the presence of a general effect of general action and inaction primes along with concept activation, in the absence of differences in mood. Although these findings are consistent with a goal activation interpretation, they are in no way conclusive. For example, the effect could be due to direct motor/cognitive activation following the concept, as has been reported in various disciplines of psychology (Bargh, 1990; Hauk, Johnsrude, & Pulvermuller, 2004). The two possibilities are of course not mutually exclusive, but it is important to determine whether goal mediation was implicated.

One defining characteristic of goals is directing people's behavior toward a particular outcome. Suppose that the observed active behavior following action primes is motivated by the goal to be active. In this case, recipients of an action prime may be able to choose a course of action that gives them the best opportunity to be active even if this choice implies a delay in satisfaction. Likewise, recipients of an inaction prime may be able to choose a course of action that gives them the best opportunity to be inactive even if this choice implies a delay of this opportunity. For this purpose, in Experiment 6, participants in the experimental condition were given the choice of (a) solving a verbal or math problem for 30 s followed by 3 min of rest versus (b) resting for 30 s followed by 3 min of solving verbal and math problems. The choices of these participants were compared against the choices of participants in the control condition who, after the priming, were simply asked to choose between 30 s of rest and 30 s of problem solving. If participants who receive action primes are motivated to be as active as possible, participants in the experimental condition should choose 30 s of rest as a way of accessing 3 min of problem solving. Correspondingly, if participants who receive inaction primes are motivated to be as inactive as possible, they should choose 30 s of problem solving as a way of accessing 3 min of rest. Notably, these effects could not be explained by mere concept activation. Activating the concept could explain the consistent choices in the control condition but should also produce the same bias in experimental conditions. That is, if motor representations are activated without goals, their effects should be apparent on the choice immediately after the prime (e.g., 30 s of problem solving) rather than on the later behavior choice (e.g., 3 min of rest).[2]

Method

Participants: Participants were 102 male and female students at Montana State University participating in exchange for credit. The design was a 2 (prime: action vs. inaction) × 2 (task description: control vs. experimental) factorial.

Experimental Procedures: Participants were primed using the word-completion task and then were asked to choose a task to ostensibly clear working memory. Participants were told that several tasks were available for control purposes. In the control condition, we asked participants to clear their minds before proceeding to other tasks. With this ostensible purpose, participants were asked to choose one of two tasks for the upcoming 30 s. Specifically, participants read "During this brief time, you can either wait quietly and do nothing for about 30 seconds, or you can solve an SAT-like problem." In the experimental condition, participants were told to clear their mind in one of two ways:

> If you choose to wait and do nothing for about 30 seconds now, the computer will direct you to solve SAT-like problems later, for 3 minutes.

[2]As another possibility, if conceptual priming operates, the primes may produce no noticeable effects. That is, the concepts of action and inaction appear in both choices of brief rest followed by longer problem solving as well as brief problem solving followed by longer rest. Hence, both choices may be selected in equal proportions.

> Or
>
> If you choose to solve an SAT-like problem for about 30 seconds now, the computer will direct you to closing your eyes and resting later, for 3 minutes.

The order of the options to rest versus to solve problems was counterbalanced. This factor had no effect on choices and therefore received no further attention. Like in Experiment 1, participants' choices were recorded and verified by observation on the part of a research assistant. Examples of the problems we used, which were fairly easy, follow:

> Which one of the five choices makes the best comparison? LIVED is to DEVIL as 6323 is to:
>
> **A.** 2336
>
> **B.** 6232
>
> **C.** 3236
>
> **D.** 3326
>
> **E.** 6332
>
> Which one of these five is least like the other four?
>
> **A.** Horse
>
> **B.** Kangaroo
>
> **C.** Cow
>
> **D.** Deer
>
> **E.** Donkey

Results and Discussion—We predicted that control participants would display the same pattern as the participants from Experiment 1, choosing to solve problems following action primes but to rest following inaction primes. In addition, we hypothesized that this effect would reverse if the initial problem solving or rest was construed as a means to attain longer times resting or problem solving, respectively. This interactive prediction was tested by means of a logistic regression with the choice of immediate behavior (1 = problem solving, 0 = rest) as the outcome variable and word prime (1 = action, −1 = inaction) and description of the task (1 = experimental, −1 = control) as predictors. The analysis yielded a significant interaction between prime and task description, Wald $\chi^2(1, N = 102) = 7.73$, $p = .005$, a significant effect of the prime, Wald $\chi^2(1, N = 102) = 4.55$, $p = .03$, and a nonsignificant effect of the task description, Wald $\chi^2(1, N = 102) = 1.44$, $p = .23$. The percentage of participants who selected the active task for the upcoming 30 s appear in Figure 1. Contrasts were performed by coding the four cells from 1 to 4 and using logistic regression to test for the differences. As shown in Figure 1, in the control condition, participants were more likely to choose the initial active task when they were primed with action rather than with inaction, p for difference < .019. In contrast, in the experimental condition, participants were more likely to choose the initial active task when they were primed with inaction rather than with action, p for difference < .006.

In conclusion, Experiment 6 provided evidence that the effects observed in Experiments 1–5 are due to the influence of general goals. Whereas control participants primed with action (vs. inaction) chose active immediate tasks, experimental participants primed with action (vs. inaction) chose to be inactive initially to participate in a longer subsequent active task. This reversed effect of the primes in experimental conditions can be plausibly explained by goal mediation. After all, goals do not produce behavior in a blind fashion but with direction toward maximizing a particular outcome. In contrast, mere concept activation is unable to explain this sensitivity to the outcome of one's behavioral choices.

Experiment 7: Effect of Satisfaction

Overview—Like Experiment 6, Experiment 7 was designed to determine whether goals are implicated in the effects of the action and inaction primes obtained in Experiments 1–5. Participants were first primed with action, control, or inaction words and then engaged in a brief randomly assigned task that could be either active (doodling) or inactive (resting). After the task, participants read a text and wrote down their thoughts about it. A greater number of listed thoughts was taken as an indication of greater cognitive activity and should be greater when participants have an action goal rather than when they have an inaction goal.

The inclusion of the task was designed to test whether the effects of the primes are discontinued when people perform behaviors that can satisfy the goal (Bargh et al., 2001; Kruglanski et al., 2002; Moskowitz et al., 2004). An action goal should be present when participants were primed with action and had no opportunity to be active, and an inaction goal should be activated when participants were primed with inaction and had no opportunity to be inactive. In contrast, if the effects of the primes are goal mediated, action and inaction primes followed by an immediate prime-consistent task should have a different effect. In particular, these satisfied action goals should yield less activity than would unsatisfied action goals, and satisfied inaction goals should yield more activity than would unsatisfied inaction goals. Whether satisfied goals return to baseline level of efforts (i.e., no different from control-prime conditions) is an empirical question. Satisfied action goals may either produce the same effort as control conditions, more effort than control conditions, or less effort than control conditions. All these possibilities would indicate that goal satisfaction decreased striving toward the desired outcome. Finding the same or more effort would indicate mere deactivation of the goal, whereas less effort would indicate the sort of rebound effect that is occasionally observed in studies of goal satisfaction (Marsh et al., 1998).

Method—Participants in this study were primed with action words, control words, or inaction words using the word-completion task used previously. At that time, half of the participants were asked to take a break and relax with their eyes closed, whereas the other half was asked to doodle or fold a piece of paper into an airplane. If goals are at stake, relaxing would satisfy inaction goals but not action goals, whereas doodling/folding would satisfy action goals but not inaction goals. Following the manipulation of goal satisfaction, all participants received a passage about vegetarianism and listed their thoughts about the text.

Participants and Design: Participants were 98 students at the University of Florida who participated in exchange for credit in an introductory psychology class. The design was a 3 (prime: action, control, or inaction) × 2 (task: active vs. inactive) factorial.

Procedures and Measures: We introduced the action, control, and inaction primes as part of the previously used word-completion task. Then, we introduced the manipulated active or inactive task and gave participants a text to read.

Active and inactive task: After the word-completion task, we explained to participants that there would be a 2-min break with the ostensible objective of clearing their mind. Participants in inactive-task conditions received instructions to rest, closing their eyes and waiting to proceed after the 2 min elapsed. In contrast, participants in active-task conditions were asked to engage in physical movement. Specifically, we indicated that a piece of paper had been provided at their workstations to facilitate movement and that they should fold it into a paper airplane or doodle on the paper. We requested that they engage in the task silently until the computer proceeded to the next screen after 2 min passed.

Text reading: The informational passage about vegetarianism contained approximately 500 words and included scientific evidence about the effects of vegetarianism. Participants read the text at their own pace and were then asked to list their thoughts about it.

Thought listing: After reading the text, participants received instructions to type the thoughts they had while reading the text on a computer. For analyses, we counted the number of thoughts listed by each participant.

Results—We used an ANOVA to examine the number of listed thoughts as a function of the word primes and assignment to either active or inactive tasks. This analysis revealed a significant two-way interaction between prime and task, $F(2, 92) = 4.36$, $p = .02$, and a significant effect of task, $F(1, 92) = 7.57$, $p = .007$, along with nonsignificant effects of prime, $F(2, 92) = 1.88$, *ns*. The mean numbers of thoughts in each cell appear in Figure 2 and supported a goal-mediation interpretation.

As shown in Figure 2, in conditions in which the task could not have satisfied a prime-elicited goal, the pattern of effects replicated the earlier experiments. That is, action primes followed by an inactive task produced a greater number of thoughts about the text than did inaction primes followed by an active task ($M = 6.94$, $SD = 3.46$ vs. $M = 3.36$, $SD = 0.81$, respectively; p for contrast = .001), and both differed significantly from the control conditions (for active task: $M = 5.00$, $SD = 2.24$; for inactive task: $M = 4.17$, $SD = 2.04$; p for contrasts = .02 in each case). This finding replicates the results from our prior experiments in which the goals presumably stimulated by the primes induced different levels of motor and cognitive output.

Experiment 7 also provided evidence concerning the role of satisfaction. With respect to satisfying inaction goals, inaction primes followed by active tasks yielded a smaller number of thoughts than did inaction primes followed by inactive tasks ($M = 3.36$, $SD = 0.81$ vs. $M = 6.50$, $SD = 2.80$, respectively; p for contrast = .006). This mean difference implies that satisfying an inaction goal decreased its effect, resulting in higher levels of activity. A similar decrease of the effect of the primes was present for the satisfaction of action goals. Action primes followed by inactive tasks yielded a larger number of thoughts than did action primes followed by active tasks ($M = 6.94$, $SD = 3.46$ vs. $M = 4.58$, $SD = 2.76$, respectively; p for contrast = .02). Again, then, the expected decrease in the influence of the action goal following satisfaction was verified.

It is also interesting to compare the outcomes of satisfied action goals with those of unsatisfied inaction goals and control primes, as well as those of satisfied inaction goals with those of unsatisfied action goals and control primes. Action primes followed by an active task (satisfied action goals: $M = 4.58$, $SD = 2.76$) still yielded a larger number of thoughts than did inaction primes followed by an active task ($M = 3.36$, $SD = 0.81$, p for contrast = .05) and than did control conditions (p for contrast = .02). This difference suggests that participants in satisfied action goals were still more active than were those with unsatisfied inaction goals. In contrast, satisfying an inaction goal led to a similar level of activity as not satisfying an action goal ($M = 6.50$, $SD = 2.80$ vs. $M = 6.94$, $SD = 3.46$, respectively; p for contrast = .72), and both of these conditions had higher means than the average of the control conditions did ($M = 4.58$, $SD = 2.76$, p for contrast = .001). This latter finding suggests that satisfying inaction goals produced effects similar to those of unsatisfied action goals.

Discussion—To summarize, we reasoned that the effect of action and inaction goals should decrease or cease if a satisfaction opportunity arises. Consistent with this possibility, action, control, and inaction primes had corresponding influences on the number of thoughts elicited during text reading when there could be no prior satisfaction of action or inaction goals. That is, unsatisfied action goals produced the highest number of thoughts, followed by control conditions and then by unsatisfied inaction goals. Critical to our analysis, however, the introduction of a prime-consistent task following the prime either reduced or eliminated the effects of the goals. This finding strongly supports the contention that the findings in Experiments 1–5 can be goal mediated.

GENERAL DISCUSSION

Although variations in overall activity are present in all species (Dumville et al., 2006; Roffwarg, Muzio, & Dement, 1966; Sears, 2005; Tsiouris, 2005), in humans this regulation is unlikely to be left up to biology alone. Some existing data suggest historical increases in human activity levels that are likely due to social and cultural factors. In the last few decades, Americans have been sleeping less (National Sleep Foundation, 2005), obesity rates have doubled (Centers for Disease Control, 2005), and the average American-family debt (along with the associated consumerism) has crept up (Federal Reserve, 2005).

To the best of our knowledge, the present article is the first to propose a mechanism that may underlie these types of trends. Specifically, we defined and tested the effects and operation of general action and inaction goals. These goals have an end state of either high or low motor and cognitive output, respectively, exert effects on motor and cognitive focal behaviors, and their effects decrease once the goals are satisfied. In the coming sections, we discuss the main findings and implications for future research.

Present Findings

The studies in this article are a first demonstration of the effects of general action and inaction goals in a relatively simple context: when available options entail activity versus rest (e.g., folding a piece of paper vs. resting) or more or less of the same behavior (e.g., learning more or less). Specifically, we activated goals with words that were broadly associated with action and inaction. These general goals then influenced responses that had no specific connection with the words that primed the goals. Sometimes these responses were trivial and not particularly conscientious, such as when participants folded a piece of paper (Experiment 1). Other times, these behaviors were important and conscientious, such as when participants solved intellectual problems (Experiments 4 and 5).

In preparation for Experiment 1, we used a lexical decision task to examine corresponding concept activation and ruled out mood effects. Furthermore, the presence of goals as an underlying mechanism was examined by assessing two types of effects that cannot derive from mere conceptual priming. First, as goals drive behavior with a particular outcome in mind, individuals with action and inaction goals should choose options that allow them to be maximally or minimally active, even when the immediate behavioral means to this outcome is not. Specifically, participants were asked to choose between a brief activity followed by a longer inactivity or a brief inactivity followed by a longer activity. Findings indicated that participants primed with action chose the brief inactive period followed by the longer active behavior, whereas those primed with inaction chose the brief active period followed by the longer inactive behavior. Thus, although control participants who were asked to choose between two immediate behaviors chose behaviors that were consistent with the prime, in the more complex choice situations, participants were sensitive to the overall outcome. This finding cannot be explained by the mere activation of a concept.

In addition, in line with past research on the cognitive and motivational properties of goals (see Chartrand & Bargh, 2002; Förster et al., 2005; Kruglanski et al., 2002), we found that the effects of priming action and inaction decreased when a goal-satisfying task was executed. Specifically, action and inaction primes produced, respectively, larger and smaller numbers of thoughts in response to a written text. However, the effect of action primes decreased when participants were asked to doodle before processing the written text, and the effect of inaction primes was reversed when participants were asked to rest before processing the text. This pattern may result from a Zeigarnik (1967) type of effect (see Förster et al., 2005). That is, rather than merely producing deactivation of goals, satisfaction of the inaction goal produced a clear push towards action.

The finding that the effects of both action and inaction primes are sensitive to both potential outcomes and satisfaction is important for reasons other than ruling out conceptual priming. At first sight, the effects of action/inaction priming might be construed as an influencing motivation, with action primes producing high motivation and inaction primes producing low motivation. If this hypothesis were plausible, one should observe goal mediation only for action-prime conditions, presumably the ones in which motivation would be strong. However, the results from Experiments 6 and 7 highlight that both action and inaction primes produced commitment of resources to achieve an end even when the ends differed. That is, both action and inaction goals entail comparable motivation, although the end state individuals are motivated to achieve varies.

Future Directions

This work has several implications for future research. Some implications concern the effects of action and inaction goals when there is more than one focal behavior that can satisfy the same general goal. Other directions include studying cross-cultural and individual differences in these general goals.

Selecting Different Viable Behaviors to Satisfy Action and Inaction Goals— Future research should address the effects of general action and inaction goals when people enact or consider enacting more than one specific behavior. For example, individuals may intend to both cook a meal and check their children's homework, or to exercise, watch television, and eat. In this case, the selection of a specific means to goal satisfaction should depend on the perceived ease and desirability of each behavior (Ajzen & Fishbein, 2005). Action goals may prompt selection of active behaviors but which active behavior to choose should depend on other factors (e.g., salience, desirability, and the operation and strength of additional goals).

Similar considerations arise with respect to well-learned, dominant behaviors as opposed to new behaviors. If only a new behavior is focal, action goals should facilitate learning that behavior. However, action (vs. inaction) goals may also facilitate the application of a previously learned routine when such routines are available. Importantly, dominant responses may emerge when impulsive individuals are primed with action, even when these responses are prone to error. Furthermore, by activating dominant responses, action (vs. inaction) goals may sometimes reduce learning of new procedures. In any event, the conditions under which action and inaction goals trigger stability and change in behavior deserve research attention in the future.

The effects of action and inaction goals on attitude change and personality expression may also be analyzed in the future. For example, various forms of processing related to persuasive communications may be respectively enhanced and reduced by action and inaction goals. In addition, action and inaction goals may influence the expression of personality tendencies in a variety of contexts. For instance, activating a general action goal may increase promotion and prevention strategies (see Higgins, 1997) among chronically high-promotion and high-prevention people. As another example, action goals may trigger different behavioral choices for high-locomotion and high-assessment individuals (Kruglanski et al., 2000), such that locomotors may choose motor activities and assessors may choose cognitive activities. Similarly, chronic behavioral activation and inhibition (Carver & White, 1994) and action/state orientation (Kuhl, 1985) may determine whether effective planning or rumination predominate in response to action goals.

Relations to Brain Responses—General action and inaction both depend on activation and inhibition at the neural level (J. L. McClelland & Rumelhardt, 1986). Depending on what focal behavior is used to pursue an action goal, the goal may require inhibition, release of inhibition, or activation. One may need to inhibit perceptual functions for executive control processes to operate and release inhibition of motor behavior to satisfy general action goals by means of movement. By the same token, inaction may require inhibition of movement or activation of mental strategies (e.g., counting sheep) that promote inaction before a state of inaction is attained. In any case, the excitatory and inhibitory outcomes of action and inaction concepts may deserve attention in the future.

Action Versus Perception—One interesting aspect of Experiment 3 is that action and inaction primes may have modulated not only motor output but also perception of the videotaped behavior. For example, participants may have become more sensitive to the behaviors of the target person without any active attempt to segment these behaviors or indicate this segmentation by pressing the computer space bar. In the future, general action and perception could be primed to see if the same or different effects emerge. As perception and action are linked at the neurofunctional level (see Rizzolatti, Fogassi, & Gallese, 2001), priming perception and action may both increase perception, mimicry, and adoption of the goals of others (for a review of these phenomena, see Dijksterhuis, Chartrand, & Aarts, 2007). Future research should examine these possibilities.

Achievement and Flexibility Priming—Establishing that general action and inaction goals can be activated in the laboratory raises the question of whether these goals have been activated in prior studies. For example, priming achievement and flexibility has demonstrated effects on a variety of tasks (see Bargh et al., 2001; Hassin, 2007; Levesque & Pellitier, 2003), raising the possibility that more general action tendencies were involved. The extent to which general action goals are at stake in these situations could be established through future systematic research. For example, instead of using a single behavior as the outcome measure, the effects of achievement might be established as high engagement in achievement-relevant behaviors but low engagement in achievement-irrelevant behaviors. More generally, however, the prior effects of achievement and flexibility represent instances of general behavioral effects akin to the ones demonstrated in this article.

Cross-Cultural, Cross-Temporal, and Cross-Individual Variability in Action and Inaction Goals—Some people are active to the point of having manic episodes, whereas others lack interest in initiating activities (American Psychiatric Association, 2005). The observed effects of general action and inaction primes model these natural variations in general levels of activity.

If general action and inaction goals can yield patterns comparable to natural variations in overall activity levels, these goals may underlie behavioral differences in the real world. For instance, mania and impulsivity may correlate positively with favorable attitudes about and goals of general action. These same manifestations may correlate negatively with favorable attitudes about and goals of general inaction. Correspondingly, depression may correlate negatively with favorable attitudes about and goals of general action but positively with favorable attitudes about and goals of general inaction. In the future, these associations could be examined across individuals, regions within countries, and regions around the globe.

General action and inaction goals may also be linked to structural factors and long-standing beliefs in a community. As one example, the generation of excess capital in the Modern Era (in Europe: years 1453–1789) may have facilitated activities that were previously impossible. An increase in the sheer number of activities may have led to inferences that activity is desirable irrespective of the activity. As another example, Buddhist beliefs imply that life is inherently imperfect and that attempts to improve it backfire. As a result, these beliefs may stimulate general goals of inaction. If these hypotheses are plausible, across nations, a low gross national product and a Buddhist religion may result in more sleep, less illegal drug use, reduced caffeine consumption, and greater incidence of depression. Future archival analyses may examine these predictions.

Closing Note

This research is the first to induce general action and inaction goals to control behaviors without controlling the specific quality of those behaviors. Because these aspects are essential for effective regulation of individual and social systems, our findings have the potential to illuminate a significant range of human experiences. We hope that these data, which are the beginning of this line of research, will stimulate exciting directions in the future.

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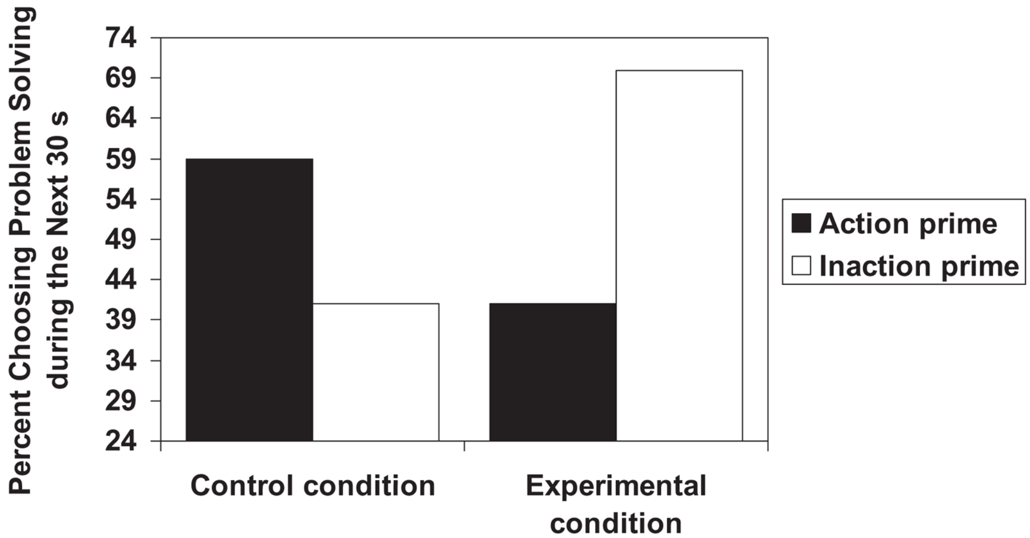

Figure 1.
Effects of primes on the percentage of participants who chose to problem solve and how the choice was described (experimental vs. control): Experiment 6.

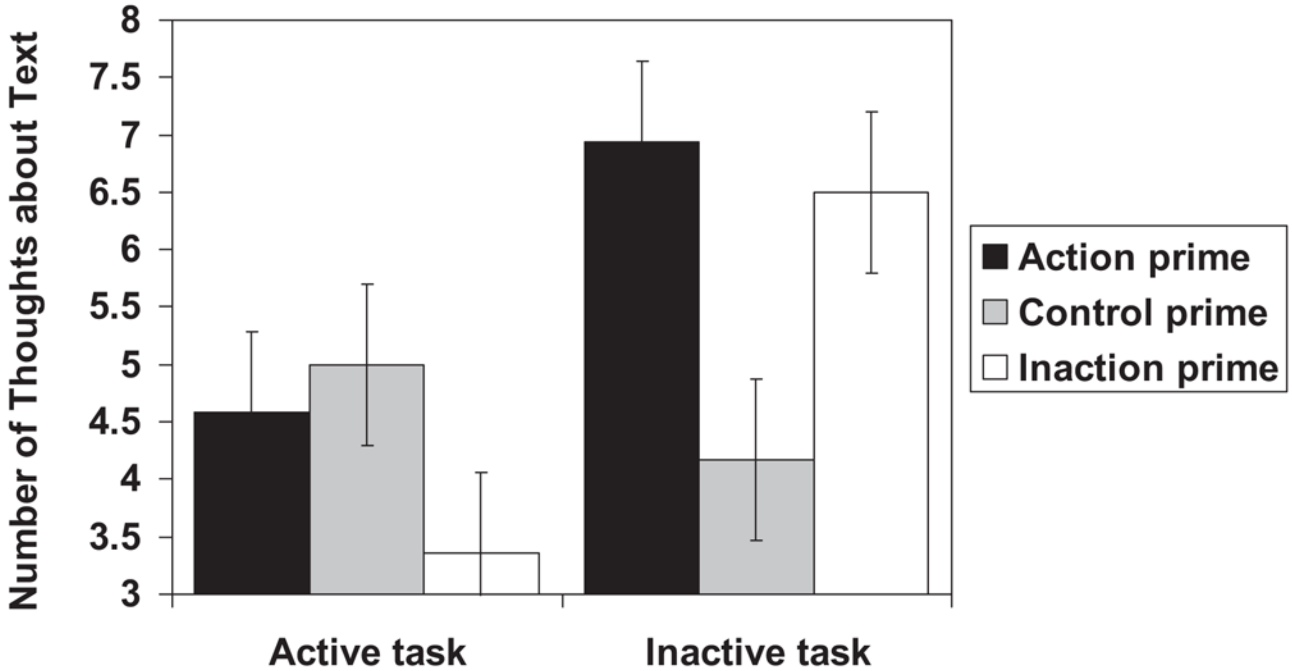

Figure 2.
Effects of primes and task introduced to produce conditions with and without goal satisfaction: Experiment 7.