Motiv Emot (2012) 36:365–370
DOI 10.1007/s11031-011-9267-0

ORIGINAL PAPER

Motivating exercise: The interactive effect of general action goals and past behavior on physical activity

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Published online: 20 December 2011

Abstract Although exercise is recognized as a powerful tool to combat obesity, remarkably few US adults pursue adequate amounts of exercise, with one major impediment being a lack of motivation for active behaviors. Recent empirical work has demonstrated that behavior can be guided by goals to be generally active or inactive. In the present paper, an experiment is presented in which participants played or observed a video game, were primed with action or inaction goals, and practiced a stretching exercise for as long as desired. Exposure to environmental action cues led to increased time spent exercising. This effect was moderated by past behavior, such that individuals who had just engaged in an active task (played a videogame) were insensitive to attempts to motivate general action. This suggests that the effectiveness of attempts to motivate activity ("just do it", "be active") hinges on the recent past-behavior of the targeted individuals. An implication of this work is that participation in certain leisure activities, such as playing videogames, may be causally related to a lack of motivation for exercise.

Keywords Action · Activity level · Exercise · Goals · Motivation · Priming

Introduction

In the past 50 years, the prevalence of obesity in the United States has increased by approximately 250%, from 13.4% of the population in 1960 to 35.1% in 2005 (NCHS 2008). Obesity not only puts individuals at increased risk of death from numerous causes (Flegal et al. 2007; Orpana et al. 2010), but it also poses economic hardships on individuals and business alike. As an example, obese individuals pay an average of 42% more for health care expenses than normal-weight individuals, and insurance agencies such as Medicare incur over $1,000 more in costs for obese than normal-weight patients (Finkelstein et al. 2009). The negative consequences of obesity have motivated a great deal of research aimed at preventing obesity and promoting health lifestyles, with most researchers and practitioners recognizing the vital role of regular physical activity (Church 2009; Godin et al. 2009; Jakicic and Otto 2006). Unfortunately, self-report measures indicate that only one in three US adults engages in the minimum recommended amount of exercise (NCHS 2009). Observational methods indicate an even more sobering state of affairs, such that when physical activity is measured with motion-recording devices, less than one in twenty adults is found to engage in at least 30 min of exercise 5 days per week (Troiano et al. 2008).

Thus, despite the widely recognized importance of physical activity in combating obesity and promoting health, most adults fail to exercise on a regular basis. Although there are a number of reasons individuals may not exercise, one important factor is a lack of motivation to pursue highly active behaviors (Godin et al. 2009). Interestingly, recent work has demonstrated that behavior can often be guided by broad goals to be generally active or inactive, regardless of what specific behaviors are ultimately pursued (for a review, see Albarracin et al. 2011). Moreover, these goals can be modulated by environmental and social cues that denote action and inaction. In one lab experiment (Albarracin et al. 2008, Experiment 1), participants exposed to concepts that denoted general action

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(e.g., "active", "go") were more likely to choose to participate in an active task rather than rest (62% vs. 38%), whereas participants exposed to concepts that denoted general inaction (e.g., "inactive", "stop") were more likely to choose to rest (64%) rather than participate in an active task (36%). Exposure to general action concepts has been shown to increase engagement in a number of highly important yet seemingly unrelated human behaviors. For example, exposing participants to action (vs. inaction or control) concepts led to increased motivation to solve math problems (Albarracin et al. 2008), increased consumption of food (Albarracin et al. 2009), faster reporting of attitudes (Albarracin and Handley 2011), and stronger reported intentions to vote in elections and volunteer for political causes (Noguchi et al. 2011). The effects of exposure to action/inaction concepts on behavior have consistently been demonstrated to be goal-mediated, and thus the pursuit of active or inactive behaviors appears to involve an important motivational component (Albarracin and Handley 2011; Albarracin et al. 2008; Gendolla and Silvestrini 2010; Hepler et al. 2011; Laran 2010). Essentially, when people are exposed to general action concepts, they activate a goal to do *something*, regardless of what they end up doing, and this goal can be satisfied by any number of otherwise unrelated behaviors.

Aims of the present research

In the present research, we sought to examine three main hypotheses related to action goals. Before discussing these hypotheses, we will present a brief overview of the experimental procedure (full details below). Participants showed up to the testing lab individually and then either participated in an active or inactive initial task. Next, half of the participants were primed with general action concepts and the other half with general inaction concepts. Finally, all participants completed an exercise task for as long as they desired, and time spent exercising served as the dependent measure. We were particularly interested in how aspects of past behavior (the initial task) would moderate the effectiveness of general action primes for motivating exercise behavior.

Hypothesis 1 Action primes motivate exercise Based on the previous experimental findings that demonstrate action primes lead to increased engagement in seemingly any behavior, we sought to verify that action primes would lead to increased time spent exercising.

Hypothesis 2 If individuals have recently completed an active task, they will be unmotivated for further action and insensitive to attempts to motivate action. When individuals achieve outcomes that are relevant to a goal, the goal becomes temporarily suppressed and ceases to exert a strong influence on behaviors that occur shortly thereafter (Marsh et al. 1998). This effect has explicitly been demonstrated with action goals, such that when individuals are motivated to be active and are given an initial active task (regardless of what the task is), they become less active on subsequent tasks compared to control participants or action-motivated participants who are not given an initial active task (e.g., Albarracin et al. 2008, Experiment 7). In this past research, the first step of the procedure was manipulating motivation for action, and engagement in an "initial" activity followed this manipulation. However, because goal suppression is predicated on attaining goal-relevant outcomes, without much concern for how, or necessarily when, the outcomes are attained (Förster et al. 2007), it is also possible that goal suppression will occur even if the goal was not explicitly activated prior to goal-outcome attainment. This seems highly plausible given that goals are often pursued flexibly and unconsciously (e.g., Bargh et al. 2001) and that goal suppression merely requires the occurrence of goal-relevant outcomes (Förster et al. 2007; McCulloch et al. 2011). Therefore, if individuals have recently performed an active task, the goal to be active may automatically become suppressed. As a consequence of the goal to be active becoming suppressed, we predict the following two outcomes:

Hypothesis 2a Participants who complete an initial active task will spend less time exercising on a subsequent task compared to participants who do not complete an initial active task.

Hypothesis 2b Participants who complete an initial active task before being primed with an action goal will be insensitive to the action priming attempt; this will render the action primes ineffective at motivating exercise (compared to participants who do not complete an initial active task and are then primed with action).

Overall, we predict that engaging in an initial active task will suppress action motivation, thus causing participants (a) to exercise less on a subsequent task, and (b) become insensitive to action primes, which will render the primes unable to motivate subsequent exercise behavior. The presence of these effects would demonstrate the critical importance of considering past behavior when attempting to motivate exercise or any other behavior.

Hypothesis 3 Playing videogames can lead to decreased motivation for exercise Because general action motivation entails being motivated to do *something*, regardless of what is done, action goals can theoretically become suppressed after engaging in any form of behavior—even a trivial behavior such as playing a simple videogame. Therefore, our third hypothesis is that playing videogames can have a causal role in demotivating exercise behaviors.

This prediction will be tested in conjunction with Hypotheses 2a and 2b—upon entering the lab, half of the participants will play a simple videogame (an active task), whereas the other half will simply watch a prerecorded videogame session (an inactive task). We predict that playing a simple videogame will suppress action goals, which according to Hypotheses 2a and 2b will result in decreased subsequent exercise behavior and insensitivity to action primes, respectively. If this is true, then playing videogames may actually demotivate people from exercising—if goals for general action are "used up" on (or suppressed in response to) videogames, then they are no longer available to be spent on exercise. Demonstrating a causal link between videogame play and decreased exercise behavior would be a novel and surprising result.

Overview

In the present experiment we seek to test three main hypotheses. The first is that general action primes can motivate exercise behavior. The second is that the recent completion of an active task will suppress action goals, which will have two effects: (a) decreased subsequent exercise behavior, and (b) insensitivity to environmental primes for action (which could have been used to motivate exercise). Finally, we test the hypothesis that playing videogames can suppress motivation for action; in conjunction with Hypotheses 2a and 2b, this would demonstrate that playing videogames can causally contribute to a lack of motivation for exercise.

Experiment

Method

Participants and overview

One-hundred eleven undergraduates in the psychology subject pool at the University of Illinois participated in this experiment. Participants signed up using an online scheduling system that does not provide any details or description of the study, other than informing participants they will be given one subject pool credit upon study completion. The sample was 58% female, with a mean age of 19.31 years ($SD = 1.34$). The sample was 59% Caucasian, 26% Asian, 4% African-American, and 11% other.

Procedures

Upon entering the lab, a research assistant blind to condition seated participants at individual computer stations and informed them they would complete a computer task, a "verbal ability task" that in reality served as a priming manipulation, and a basic exercise task. After seating participants at computers, the research assistant went into an adjacent room for the duration of the experiment; all task instructions and measurements were via computer.

Computer task Participants were presented with a computer-simulated ball-throwing game. In this game, participants view three icons on the screen, one of which represents the participant, and they observe an animated ball being passed between the icons. When the ball is passed to the participants' own icon, they are instructed to click one of the other two icons to indicate to which player they want to throw the virtual ball. The game lasts a total of 40 passes and takes approximately 5 min. Participants were randomly assigned to actively participate in this game ($n = 60$) or passively observe a pre-recorded ball-game session ($n = 51$).

Priming task Following the computer task, participants were randomly assigned to an action ($n = 56$) or inaction ($n = 55$) goal prime condition, in which participants were presented with 24 words that had certain letters missing and were asked to fill in the remaining letters to complete the words. Of the 24 words, ten were "critical words" for each group, whereas the remaining 14 were fillers. The critical words differed between action (*action, active, behavior, doing, engage, go, initiate, move, perform, start*) and inaction conditions (*dormant, inert, paralyze, pause, peace, placid, relax, rest, stationary, stop*). The final cell sizes were: $n_{participate\ +\ action\ prime} = 30$; $n_{participate\ +\ \text{inaction prime}} = 30$; $n_{observe\ +\ action\ prime} = 26$; $n_{observe\ +\ inaction\ \text{prime}} = 25$.

Exercise task Following the priming task, participants were exposed to a typed excerpt from an exercise video detailing exercises that can be performed while sitting. This type of exercise was chosen because it is suitable for individuals of all levels of physical fitness. Participants were told that they would practice one such exercise, with the ostensible purpose of providing feedback after practicing. Participants read: "Remaining fully seated with your back against the back of the chair, slowly extend your legs until they are fully straight and parallel to the floor. Hold this position for 10 s, and let your legs slowly relax until your feet touch the floor." Participants could practice the exercise described on their screen for up to 5 min, but they could click "continue" on the screen whenever they were ready to rate the exercise. The computer recorded the amount of time participants spent exercising, and this value served as the dependent measure for the task. Then, in keeping with the cover story, participants responded to five-point scale items (1 = *not at all* to 5 = *extremely*)

related to their experience. These items included "How strongly do you feel happy", "sad", "excited", and "nervous". Responses to these questions did not differ across prime or computer task conditions, Fs < 1, *ns*, which is consistent with prior work that has consistently found null effects on mood items based on manipulations of general action (e.g., Albarracin et al. 2008).

Participants were then debriefed and dismissed. During debriefing, participants were probed for suspicion and asked to guess the study hypotheses. No participants correctly guessed the hypotheses or reported a belief that their responses to any of the earlier tasks (past behavior or priming) influenced their performance on later tasks (exercise), suggesting that participants were unaware of the nature of the goal priming task and the study hypotheses.

Results

The amount of time participants spent exercising was subjected to a 2 (past behavior: participate vs. observe) × 2 (prime: action vs. inaction) analysis of variance (ANOVA). This analysis revealed a significant main effect of prime, $F(1, 107) = 6.52$, $p = 0.01$, partial $\eta^2 = 0.06$. Participants in the action prime condition exercised longer ($M = 137$ s; $SD = 94$ s) than participants in the inaction prime condition ($M = 104$ s; $SD = 66$ s). This lends support to Hypothesis 1 by demonstrating that general action primes can motivate exercise behavior.

There was also a significant main effect of past behavior on time spent exercising, $F(1, 107) = 32.62$, $p < 0.001$, partial $\eta^2 = 0.23$. Participants who observed the videogame exercised longer ($M = 162$ s; $SD = 93$ s) than participants who played the videogame ($M = 85$ s; $SD = 52$ s). This lends support to Hypothesis 2a by demonstrating that participants who initially engaged in an active task subsequently exercised less than participants who did not initially engage in an active task. Because the active task used in this experiment was a videogame, this result also lends support to Hypothesis 3 by demonstrating that participants who played a simple videogame subsequently exercised less than participants who did not play the videogame.

Finally, there was a significant interaction of prime and past behavior on time spent exercising, $F(1, 107) = 5.05$, $p < 0.05$, partial $\eta^2 = 0.05$. The cell means for this interaction are displayed in Table 1. For participants who did not initially engage in an active task (i.e., participants who observed the videogame), exposure to action primes led to significantly longer exercise times than exposure to inaction primes, $t(49) = 2.64$, $p = 0.01$, $d = 0.76$. However, for participants who were initially active by playing the videogame, exposure to action (vs. inaction) primes had no effect, $t(58) = 0.30$, $p = 0.76$, $d = 0.10$. This confirms Hypothesis 2b by demonstrating that participants who initially engaged in an active task became insensitive to subsequent action primes, whereas participants who did not initially engage in an active task exercised more in response to action (vs. inaction) primes. Additionally, this interaction lends further support to Hypothesis 3 by demonstrating that initial participation in a videogame not only leads to a direct decrease in time spent exercising, but is also renders environmental attempts to motivate further action (in this case exercise) to be ineffective.

Table 1 Average time spent exercising in seconds as a function of past behavior and goal prime

	Observed	Participated
Action prime	194 (96)	87 (58)
Inaction prime	129 (77)	82 (47)

The values represent mean number of seconds spent exercising with standard deviations in parentheses

Discussion

Obesity rates have increased dramatically in recent years (NCHS 2008), and this has resulted in a variety of negative health and economic consequences for individuals and society alike (Finkelstein et al. 2009; Flegal et al. 2007; Orpana et al. 2010). Overwhelmingly, an active lifestyle incorporating regular physical activity is considered to be crucial in combating obesity (Church 2009; Godin et al. 2009; Jakicic and Otto 2006). Unfortunately, even the most optimistic estimates indicate that less than one in three US adults regularly engages in adequate amounts of exercise (Troiano et al. 2008; NCHS 2009), with one important barrier to exercise being a lack of motivation to engage in highly active behaviors (Godin et al. 2009).

Interestingly, recent empirical work has demonstrated that behavior can be guided by broad goals to engage in active or inactive behaviors, regardless of what behavior is ultimately pursued (Albarracin et al. 2008, 2011). Furthermore, these goals can be moderated by exposure to environmental stimuli that denote the concepts of action and inaction. Therefore, for the present experiment, we hypothesized that exposure to environmental cues denoting action would lead to increased engagement in exercise. Furthermore, we sought to test an important boundary condition for the effectiveness of these environmental cues—specifically, because the pursuit of action appears to be regulated as a goal (Albarracin and Handley 2011; Albarracin et al. 2008; Gendolla and Silvestrini 2010; Laran 2010), the prior completion of action-relevant behaviors should have a suppression effect on subsequent

exercise behavior. That is, if individuals have recently completed an active task, they should be (a) less motivated for further action such as exercise and (b) insensitive to environmental primes for action that could otherwise be used to motivate exercise. Finally, because action goals can be satisfied with any form of active behavior, we sought to test the intriguing hypothesis that playing a simple videogame could lead to the suppression of action motivation; in conjunction with the former hypothesis concerning action goal suppression, a demonstration of this effect would indicate that playing videogames can causally contribute to a lack of motivation for action.

The results of our experiment provide support for each of these hypotheses. First, environmental cues to be active led to increased exercise behavior. Second, it appears that if participants have recently completed an active task, motivation for action becomes suppressed. Specifically, participants who initially engaged in an active task (a) exercised less on a later task and (b) did not display increased exercise in response to environmental action primes (whereas participants who did not engage in an initial active task did display increased exercise in response to action primes). Finally, because the initial active task in this experiment was a simple videogame, the present results also demonstrate that playing videogames has the potential to causally contribute to low levels of exercise.

The present work underscores the importance of considering past behavior when examining the effects of general action goals on exercise. If individuals have recently been active (by doing *anything*, not just exercise behaviors), then it may be futile to try to persuade them to exercise shortly thereafter. Importantly, this is not a physiological consequence of over-activity leading to a much needed period of rest. Instead, this is a motivational effect whereby recent activity suppresses a goal to be active, leading to a temporary reduction in motivation to engage in other active behaviors. Indeed, the "active behavior" that ultimately led to decreased motivation for exercise was a simple 5-min videogame. This highlights two points: first, recent past-behavior is a crucial factor that influences the effectiveness of certain motivational appeals; second, behaviors that are seemingly unrelated (e.g., playing videogames and exercise) can exert a causal influence on one another if they both act as a means for the same goal, such as a general goal for action.

Concluding remarks

Although past work has found a reliable negative correlation between playing videogames and exercising (e.g., Ballard et al. 2009), this previous work has not addressed the potentially causal role of playing videogames in pursuing exercise behavior. Instead, explanations for this negative association tend to focus on issues such as limited leisure time. However, the present experiment provides some initial evidence that playing videogames may actually have a causal role (via motivation) in leading to low physical activity levels. This is an important finding that should be explored in future research and has a number of interesting implications for how leisure time could be structured to promote healthy lifestyles.

Overall, the present experiment suggests that general action cues can motivate exercise behavior, but the effectiveness of these cues is moderated by past behavior. Specifically, if individuals have recently been active, environmental cues to be active are not likely to motivate further activity. This type of temporary suppression is a hallmark of goal-driven behaviors (Marsh et al. 1998) and highlights the importance of accounting for motivation to pursue highly active behaviors when examining factors that influence exercise motivation (e.g., Godin et al. 2009). Promoting general activity ("just do it", "stay active") can be an effective route to promote exercise, but at the same time, these appeals for general activity can be rendered ineffective if they are delivered when individuals have recently been active in other areas of life (e.g., work or leisure).

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