

# Exercise: Why It Is a Challenge for Both the Nonconscious and Conscious Mind

Seppo E. Iso-Ahola  
University of Maryland

The epidemic of physical inactivity is an important societal and individual problem. Despite the well-documented health effects of physical activity, only 22% of the population exercises regularly enough to get the physiological and psychological benefits (S. N. Blair, 1993, Physical activity, physical fitness, and health. *Research Quarterly for Exercise and Sport*, Vol. 64, pp. 365–376.) Why does 78% fail to do so? The problem is largely psychological and attributable to the processes of nonconscious and conscious mind. This paper reviews research on how nonconscious and conscious processing affects human behavior in general and exercise behavior in particular. Although there generally is no question about the effect of the nonconscious mind on human behavior, “unconsciously operating motives” in and of themselves are incapable of igniting and sustaining this complex behavior—at least until the behavior has been repeated with regularity and long enough to become consistently prompted by situational cues (as is the case for 22% of the population). There is even some evidence to suggest that the nonconscious mind actually works against exercise by embracing cues and excuses for *not* exercising. A related problem for both the nonconscious and conscious mind, especially that of the occasional exerciser (54% of the population), is that exercise poses a threat to one’s sense of freedom and choice (i.e., “you must do it or else”). The resultant psychological reactance leads to attempts to restore this freedom, but it is often accomplished by giving in to temptations (e.g., TV watching). Although people recognize fitness and health as important human conditions, they often pursue these goals by using exercise as a means toward another end (e.g., to lose weight). In doing so, they struggle cognitively with their need for autonomy while trying to balance it in interpersonal and leisure contexts. Such struggle depletes finite self-control resources and makes people more vulnerable to temptations. The net result is that both the nonconscious mind and the conscious mind fail to turn most people into rational thinkers and “self as doers,” who would do what is best for their health.

**Keywords:** exercise, consciousness, nonconscious and conscious mind, perceived freedom, cognitive dissonance

Exercise holds a key for one of the nation’s major economic problems: the health-care system and its suffocating costs. Economists (Keeler, Manning, Newhouse, Sloss, & Wasserman, 1989) have calculated that each sedentary person costs society \$1,900 in lifetime subsidies, twice the amount of smokers. They have suggested that if all “couch potatoes” started exercising even minimally, the savings for the health-care system would be in the hundreds of billions of dollars. These savings would result from the strong and indisputable effects of exercise on the prevention and treatment of major illnesses, from heart disease and cancer to stroke and diabetes and depression (e.g., Lee et al., 2012; Blumenthal et al., 2007). As a recent campaign to promote exercise and its value proclaimed: “Exercise is medicine.” Yet, 78% of Americans

do not exercise regularly enough to receive the physiological benefits; only 22% of the population attains the positive effects of regular exercise (Blair, 1993). That exercise is a major challenge for most people is indicated by the evidence showing little or no change in the proportion of sedentary individuals over the last four decades (Talbot, Fleg, & Metter, 2003). This pandemic of physical inactivity (Kohl et al., 2012) is not only a societal problem but above all, an individual problem.

Why, then, does 78% of the U.S. population fail to exercise regularly? It is clear that the mere knowledge of the benefits of exercise has little or no effect on people’s behavior (e.g., Tai-Seale, 2003); if it did, everybody would be a regular exerciser, given the indisputable and known health benefits of exercise. Studies (Knapp, 1988) have shown that nearly everyone values and knows the importance of exercise and yet does not translate it into action. If knowledge and education do not get people moving, could the problem possibly emanate from genetic influences? Do we have a “lazy gene” that prevents us from being physically active? In other words, 78% of the population somehow inherited this gene, whereas 22% missed it—hardly a convincing argument. A brief look at human history reveals we were made to be physically active and remained so up until the beginning of the technological age (Blair, 1988). Even if one accepts that genes primarily drive our behavior through motivations (Tomasello, Carpenter,

---

This article was published Online First November 26, 2012.

The author is grateful for an associate editor’s insightful ideas and suggestions for improvement of the paper. Similarly, comments by Bradley Hatfield, Roger Mannell, and Matt Miller were most helpful; I am indebted to them for their contributions.

Correspondence concerning this article should be addressed to Seppo E. Iso-Ahola, PhD, Department of Kinesiology, School of Public Health, University of Maryland, College Park, MD 20742. E-mail: isoahol@umd.edu

Call, Behne, & Moll, 2005), there is no evidence that genetic mutations would have changed physically active genes into lazy genes, especially when considering how recently and fast the change from physically active to sedentary lifestyles has occurred. Nor do genetic mutations explain the dramatic rise in the percentage of overweight and obese individuals during the last 30 years or so.

Instead, it is the culture in which we live that has rapidly transformed us into sitters from movers. We sit at work, in cars while traveling to and from work, and at home watching TV or whatever else we do. This all suggests that the roots of failure to exercise are cultural, social and psychological. This cultural and psychological effect was recently demonstrated experimentally in the context of fast-food eating. Zhong and DeVoe (2010) showed that the subliminal exposure to fast-food symbols led to increased haste and impatience and preferences for time-saving products and behaviors. The increased impatience even made people choose financially inferior options. The findings led the authors to conclude that a fast-food culture, by extolling the virtues of time saving, changes not only how people eat but how they approach life in general: "Activities that used to be orthogonal to time concerns (e.g., leisure) are now experienced through the colored glasses of impatience" (p. 622). Thus, it is not surprising that in survey after survey (e.g., Johnson, Corrigan, Dubbert, & Grambling, 1990; Rhodes & Plotnikoff, 2006), the first and most important reason for not exercising is: It "takes too much time." This explanation, however, is superficial and may reflect nothing but "culturally learned stereotypes" of why people generally do not exercise (Nisbett & Wilson, 1977). In an effort to provide a deeper and more comprehensive explanation, the present paper reviews research on the nonconscious mind and automatic processes, as well as relevant studies on the effects of conscious thoughts and cognitive mechanisms on why a minority of people exercises regularly, but the vast majority fails to do so.

In doing so, the paper aims to clarify the role of the nonconscious and conscious processes in initiating and sustaining human behavior in general, and exercise behavior in particular. Although researchers have recently debated the causality of the nonconscious and conscious mind in human behavior, they have not done so in relation to specific behaviors, especially important individual and societal health behaviors such as exercise. Similarly, exercise psychologists have overlooked this fundamental issue as it relates to the cause of exercise behavior. By examining the dynamic relationships between nonconscious and conscious processes in a specific behavioral context, the present review and analysis of research seeks to shed further light on these fundamental processes, and concomitantly provide an explanation for this specific behavior.

It should be noted that, due to a dearth of empirical studies directly addressing some phenomena discussed in the paper, the present review is more of a conceptual and theoretical review of research on relevant psychological processes than a conventional review of empirical studies alone. As such, it aims to offer a novel perspective from the available logical and empirical evidence and propose plausible, but unproven, interpretations. Although a diverse assortment of perspectives, ideas, and findings are brought to bear on the key question (why some succeed and most fail to exercise), many ideas remain hypotheses to be tested empirically in the future.

## Exercise and Habit

At first glance, it appears that regular exercise should be easy, as humans are habitual beings. In fact, the whole of human life seems to be nothing but habit. We eat breakfast, we go to work, do some work, eat lunch, do some more work, go home, eat dinner, watch TV, and go to bed—the same thing day after day. This habitual activity is largely driven by the obligatory nature of work and the other required activities of daily life. It is then hardly surprising that about 45% of everyday behaviors are repeated in the same location almost every day (Neal, Wood, & Quinn, 2006; Wood, Quinn, & Kashy, 2002). On the other hand, 55% of daily activities or behaviors are not repeated with consistency, possibly because these behaviors are not perceived obligatory. If the social contract of work is the main culprit for making people habitual, the other side of it, nonwork (or free time, or leisure), supposedly represents freedom from work and freedom to do what one wants to do, at least in theory (Iso-Ahola, 1980). One would then think that people would revel in their autonomy and do all kinds of different things in their leisure. But a quick look at people's leisure patterns tells us otherwise: Americans spend about five hours a day, on average, watching TV (Nielsen, 2009). It appears that the work-related habitual mind set is spilling over into leisure and making people creatures of habit in all areas of their lives. In light of this overriding tendency for habitual living, why has exercise not become habitual for the majority? After all, people know it is good for their physical and mental health (Knapp, 1988). Further, if exercise became a nonconscious and habitual activity, one would be able to repeat it as easily as brushing his or her teeth in the morning. But, is this degree of nonconsciousness and habitualness possible in exercise?

It is important to consider that habit is not behavior. As Mittal (1988, p. 997) noted, "Repeated occurrence is necessary for the formation of habit, but is not habit itself." Unfortunately, habit continues to be defined by behavior. Wood et al. (2002), for example, operationalized habits "as behaviors participants reported performing just about every day and usually in the same location" (p. 1285). Similarly, Wood, Tam, and Witt (2005) created "habit measures for each behavior from participants' reports of the frequency of performance and stability of supporting circumstances" (p. 922). In this approach, habit is equated with the frequency of behavior, with frequent behaviors labeled habits and infrequent ones nonhabits. But, when is behavior frequent enough to be called a habit? Already in 1922, Dewey wrote that "the essence of habit is an acquired predisposition to ways and modes of response, not to particular acts" (p. 42). Consistent with this approach, Verplanken (2006) emphasized habit as a mental construct and showed that it is possible to manipulate habit strength independently of frequency of behavior. Even Wood and her associates in their later theoretical work seem to embrace this separation of habit from behavior as they have seen habits as "automated-response dispositions" (Neal et al., 2006) or "learned dispositions to repeat past responses" (Wood & Neal, 2007). Thus, a common thread appears to be mental readiness or preparedness to act in general and specific ways. Exercise habits can therefore be defined as action tendencies or predispositions toward physical activity. This general tendency becomes stronger with increased repetition of behavior. It also grows more nonconscious and automatic with repeated performance (Neal, Wood, Labrecque, & Lally, 2012).

Is exercise habitual? As noted earlier, only 22% of the population is able to repeat this behavior with regularity. It is then clear that most people's habit strength for exercise is low or nonexistent. Without repeat performance, habit formation is not possible. Occasional exercise (54% of the population; Blair, 1993) is not regular enough for building a repeatable habit. A question, then, is: For how long does exercise have to be repeated with regularity for it to become a habit? Evidence indicates that the drop-out rate stabilizes at about five weeks after the initiation of an exercise program. Armitage (2005) reported that the mean "survival" time was 5.62 weeks, meaning that, on average, participants maintained their attendance in exercise programs for 5 weeks. The proportion of people surviving beyond 5 weeks without a lapse was only 18.7%. Attendance during the first five weeks had a significant effect on subsequent attendance, but from Week 6 on, prior attendance had no significant effect on subsequent behavior. This pattern suggests that behavior up to Week 5 is critical in determining subsequent behavior and implies that it may take five weeks to develop a habit for exercise behavior. These data also suggest that most people may never succeed in making exercise habitual (recalling that only 19% were able to maintain weekly attendance without lapse at Week 5). There seems to be a barrier (perhaps five weeks) over which most people are unable to climb, but those who are able to do so are much more likely to become habitual exercisers. In light of such findings, past behavior (early program attendance) is necessary and instrumental for the formation of exercise habits, but it is not sufficient because, for one thing, these habits can easily be disrupted (e.g., Wood et al., 2005). Therefore, other psychological forces and processes have to be considered. The first and foremost question is how the nonconscious mind affects human behavior.

### The Nonconscious Mind and Exercise

A long line of research over the last 20 years has shown that much of everyday social behavior can become automatic (Bargh, 1997). If an individual repeatedly pursues a certain goal in a situation, subsequent exposure to that situation is sufficient to automatically and nonconsciously activate the goal and lead to goal-directed behavior (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001). Herein lies the problem, however: If a behavior is not repeated with regularity and for long enough, the automatic activation of a goal will not materialize and the predisposition in this case toward physical activity (i.e., exercise habit) will not develop. Further, repeated behavior has to occur in a stable environment for the cues (e.g., time, events, people) to become associated with the behavior so that they can eventually trigger the behavior automatically (Neal et al., 2006; Wood et al., 2002). On the other hand, the more often and consistently exercise behavior occurs in the same stimulus situation, the more powerful will that stimulus situation become as a cue for exercise (Knapp, 1988). All of this suggests that in theory, exercise has the potential to become an automatic behavior. Those who do a daily workout in a gym or those who go for a daily walk/run are repeating their behaviors with regularity and in a stable environment. This is the case with 22% of the population who are able to maintain consistency in their exercise behavior. In doing so, they have even been able to reduce this seemingly complex behavior to a level comparable with simple acts like brushing teeth in the morning, readily cued by

situational features (Iso-Ahola, 2009). However, the fact that 78% of the population is sedentary and only 19% of people can repeat their exercise regimen for five weeks without a lapse (Armitage, 2005) shows that for the majority, exercise does not operate at the level of the nonconscious mind.

If situational cues are to activate habitual exercise behavior, what goal is being triggered? In general, people prefer enduring and abstract goals to which they are committed, such as being a good mother or a high achiever or staying healthy and physically fit (Vallacher & Wegner, 1987). There is plenty of evidence that such general goals of action are vital determinants of many important human behaviors (Albarracín, Hepler, & Tannenbaum, 2011). Encountering situational cues will arouse the relevant general goal and eventually, the choice (e.g., to exercise) becomes just another routine of the mental system, and therefore having to make a conscious choice is bypassed. The enduring goal of staying healthy and fit, however, is problematic because it is typically identified with extrinsic motivation (Iso-Ahola, 1999; Iso-Ahola & St. Clair, 2000); that is, people think they "should" exercise to lose weight, for example. It is easier to make something, even exercise, routine if it has intrinsically motivating elements (e.g., enjoyment and sense of autonomy and competence; Iso-Ahola & St. Clair). If the enduring goal for exercise is based upon extrinsic factors or internal pressures ("I should"), then it is more easily interrupted by perceived constraints than if it reflects true choice and desire (Iso-Ahola et al., 2006). Intrinsic rewards make effortless the pursuing of this enduring goal over time, which means that for situational cues to automatically activate exercise behavior, they should trigger intrinsic goals for this behavior. If, on the other hand, these cues become reminders of an obligation, they lose their power of activation and therefore do not facilitate sustained exercise involvement. This theorizing (Iso-Ahola & St. Clair, 2000, pp. 136–137) is consistent with the theory and evidence of unconscious goal pursuit (Custers & Aarts, 2010), and is supported by recent evidence indicating that self-determined regulation has a direct effect on habit strength, independent of past exercise behavior (Gardner & Lally, *in press*).

It is obvious that when people are in the early stages of an exercise program (e.g., the first five weeks), their decision to engage in this behavior on a given day is primarily, if not totally, conscious and cognitive. How about after the threshold has been successfully passed and exercise has become routine? Is it then driven by the nonconscious mind? Those who subscribe to the power of the nonconscious mind would quickly answer affirmatively. This group of psychologists (e.g., Bargh, 1997; Libet, 1985; Pocket, 2006; Roediger, Goode, & Zoromb, 2008; Wegner, 2002; Wilson, 2002) gives little credence to conscious thought in affecting human behavior; some (e.g., Dijksterhuis, Chartrand, & Aarts, 2007) go so far as to state that "behavior does not originate with a conscious decision". . .because there is "no role for consciousness" (p. 52). They argue that acts of the nonconscious mind always occur before those of the conscious mind, that is, "actions precede reflection" (Bargh & Morsella, 2008).

There is evidence that neurological preparation for an action begins before a person consciously makes the decision to act (Haggard, 2008; Libet, Gleason, Wright, & Pearl, 1983), in some cases even eight seconds before the action (Soon, Brass, Heinze, & Haynes, 2008). Such findings, however, have been increasingly challenged on methodological grounds (e.g., González-Vallejo,

Lassiter, Bellezza, & Lindberg, 2008), and by the fact that automatic responses can be overridden by conscious thoughts (e.g., Fiedler, Bluemke, & Unkelbach, 2009). Further, the much-heralded findings of Libet et al. appear to be methodologically flawed and therefore an artifact (Miller, Shepherdson, & Treyena, 2011). Miller et al.'s data do not support the claim that movement preparation begins nonconsciously.

Aside from the controversy, what does this mean for exercise behavior? Bargh and Morsella (2008) claim that nonconscious behavioral impulses are derived from evolved motives and preferences, cultural norms and values, past experiences in similar situations, and from what other people are doing in the same situation at a given time. This means that unconscious activity has its roots in everyday social life rather than being merely a product of chemical and electrical reactions between neurons. It also means that an exerciser's brain generates impulses from any of these four sources and as a result, "unconsciously operating motives" may lead to actual exercise behavior. Although such a link between the nonconscious mind and behavior may be possible in an extreme case (i.e., regular exercise done for a long time and in the form of simple activities like walking and running), the link has not developed for most exercisers (Iso-Ahola & St. Clair, 2000). Even simple motor behaviors (e.g., walking) as forms of exercise often become cognitively complex because of the demands and allure of daily social situations, and are therefore resistant to becoming automated and falling under the influence of the nonconscious mind. The problem is similarly difficult when considering the thought processes that have to be engaged to make some exercise behaviors possible in the first place, such as arranging weekly racquetball games.

At a level of simple responses, there is evidence for the link between the nonconscious mind and exercise. For example, Bluemke, Brand, Schweizer, and Kahlert (2010) reported that regular exercisers responded faster to positive words, and nonexercisers faster to negative words, following subliminal exercise primes. Exercisers had more positive and nonexercisers more negative associations with exercise. Similarly, Neal et al. (2012) found that subliminal priming of context cues increased the recognition speed for the words "running" and "jogging" among participants with stronger running habits. However, the fact that exercisers and nonexercisers differed in their reaction time (RT) to subliminal exercise primes does not mean that nonconscious activation caused one group to become exercisers and the other nonexercisers. The implied causality in such studies is, therefore, troubling.

Another problem with these kinds of studies is that the effects of nonconscious priming have typically been demonstrated on simple tasks, such as hand movements and choices made to stimuli on computer screens. This limitation has prompted many (e.g., Baumeister, Vohs, & Funder, 2007) to wonder what finger-press responses have to do with more complex and real-life behaviors. The difference between simple choices in an artificial task in a laboratory and the decision to go to a gym for a workout is indeed monumental. A related problem arises from the fact that exercisers, especially the occasional (54%), lapse from time to time, which affects the cue-exercise behavior relationship (Wood et al., 2005). These lapses or disruptions make the entire process of exercising immediately conscious and even emotional to participants. "How did I let it happen? How can I make up for it? Am I

able to continue my exercise routine?" It is then likely that consciousness is intimately involved in the occasional as well as regular exercisers' thoughts and actions, though to a lesser extent among the latter as they lapse relatively infrequently. This, however, is a hypothesis in need of empirical testing.

The finding that automated habits can easily be disrupted by changes in circumstances (Wood et al., 2005) poses problems for the position that there is "no role for consciousness" (Dijksterhuis et al., 2007). Wood et al.'s data showed that when the cue-behavior association was undermined by changes in context, the exercise behavior reverted to intentional (conscious) control. This finding is consistent with Iso-Ahola's (1980, p. 247) idea that "when intrinsic leisure motivation is violated" (i.e., one is hindered from engaging in intrinsically motivated leisure behaviors), people become immediately aware of the a priori reasons for their involvement. When this goal-directed behavior (exercise) becomes a problem, or is anticipated to become a problem, implementation intentions (when, where, how to participate) are formed to facilitate and promote involvement in the activity (Gollwitzer, 1999). Gollwitzer showed that implementation intentions can be twice as effective as other motivational methods for enhancing the rate of exercise behavior. It is important to note that when implementation intentions have been compared with the procedures designed to strengthen the cue-behavior link, they have been found to be more effective in maintaining the behavior in the long run, though in the short run, implementation intentions (conscious) and cue-behavior links (unconscious) seem to be equally effective (Papies, Aarts, & de Vries, 2009).

In short, there is no question about the effect of the nonconscious mind on behavior in general or even about the notion that most of the daily reactions are automatic (Bargh, 1997; Kahneman, 2011). However, as Baumeister, Masicampo, and Vohs's (2011) extensive review of research demonstrated, consciousness often reduces the power of situational cues and influences. Further, self-paced conscious thought performs better in a choice environment than unconscious thought (Payne, Samper, Bettman, & Luce, 2008). If the nonconscious mind is inherently no better than the conscious mind, why does much of what people think and do originate from it? Kahneman (p. 35) has made a compelling case for "the law of least effort," that is, people choose the least demanding course of action to achieve a goal. They are predisposed to use "System 1" (unconscious, fast, intuitive, automatic) and avoid "System 2" (conscious, slow, deliberate, effortful). Tasks and activities that require either cognitive or physical effort are shunned because people expend effort only when they need to (Bijleveld, Custers, & Aarts, 2012).

The above theory and evidence means that System 1 (nonconscious mind) is inherently opposed to the idea of exercising. Because System 1 dominates thinking in everyday life, people often uncritically follow their nonconscious intuitions and tend to be impulsive, impatient, and keen to receive instant gratification (Zhong & DeVoe, 2010). In contrast, exercise requires perseverance, delay of gratification (e.g., in losing weight), and weighing its pros and cons (Wankel & Thompson, 1977). Perhaps most remarkably, Kahneman (2011) showed that when faced with a difficult question (e.g., Should I exercise today?), people tend to answer an easier one instead (e.g., Isn't there a good program on TV tonight?) without their conscious awareness. When further considering the fact that System 1 requires no effortful thinking

and self-control (Kahneman), it becomes clear that the task for the nonconscious mind to get people moving is formidable, if not insurmountable.

The bottom line is that for the most part, the nonconscious mind is incapable of igniting and sustaining this complex, demanding, and long-term behavior. Situational cues can activate in the nonconscious mind the enduring goal to stay healthy and fit, but if the behavior has not been repeated with regularity and long enough, it will not occur. Thus, the conceptual model advanced here is that the nonconscious mind sets the stage first by activating an enduring and abstract goal for a behavior (exercise), then the conscious mind gets heavily involved in decisions regarding the behavior, and after a while (after many repeats), the conscious mind relegates its control back to the nonconscious mind to direct or not to direct this behavior. The suggested model is consistent with Baumeister et al.'s (2011) conclusion that "it is plausible that impulses to act generally originate in the nonconscious, but behavioral outcome depends crucially on what happens when they are contemplated consciously" (p. 334).

Thus, conscious thoughts mainly process, elaborate, and explain the information one already has in his or her mind. As countless studies have shown (see Baumeister et al., 2011), conscious states can be experimentally and situationally manipulated, thereby "importing" nonconscious thoughts (e.g., staying healthy and fit) into the mind and making them salient and ready for elaboration. Eventually (i.e., after numerous repeats of behavior), however, these conscious thoughts recede and are relegated to nonconscious processing, meaning that behavior is largely mediated by the nonconscious mind. Even if behavior is repeated long enough, and thus becomes controlled by the nonconscious in the end, it is clear that conscious thoughts constitute a critical link in the causal chain (Baumeister et al., 2011) rather than being a side effect or trivial "sense maker" (Bargh & Morsella, 2008). Moreover, the nonconscious is handicapped, as it can only process single-word information, but not sentences (Baars, 2002) and logical reasoning (DeWall, Baumeister, & Masicampo, 2008; Kahneman, 2011). Thus, consciousness is needed for interpreting complex information and interpersonal communication. All of this poses major problems for the nonconscious to initiate and maintain exercise behavior, at least until this behavior has been repeated long enough for it to become habitual or automatic.

Although situational cues can remind nonexercisers nonconsciously (Aarts, Gollwitzer, & Hassin, 2004) of their goal of staying healthy and fit, the very fact that 78% of the population does not exercise regularly strongly suggests that such cues (and the nonconscious mind) are ineffective in inducing and causing this complex behavior in the long-term. It is only the regular exercisers (22%) whose behavior is, to a large extent, affected and guided by the nonconscious mind. For them, cues in a stable environment trigger the abstract goal of being healthy and fit and subsequently, actual exercise behavior. Evidence indicates that continuous repeating of this behavior builds "implicit attitudes," which then predict exercise participation (Conroy, Hyde, Doerksen, & Ribeiro, 2010). With the activation of the highly important goal, regular exercisers are also less likely to indulge in temptations in general (Fishbach, Friedman, & Kruglanski, 2003) and in one strong temptation in particular—TV watching (Iso-Ahola, 2009). The relationship between intention and behavior is weak among these habitual exercisers (Chatzisarantis & Hagger, 2007),

because they do not have to rely on "mindfulness" (consciousness) any more. However, even regular exercisers' behaviors are easily disrupted by changes in stable contexts (Wood et al., 2005), so that conscious thoughts are never far away. Seeking to better understand this back-and-forth process between the nonconscious and conscious mind in various behaviors is an exciting challenge for future research. Health behaviors in particular provide useful platforms for testing deeper theoretical mechanisms on the interconnected operations of the nonconscious and conscious mind.

## The Conscious Mind and Exercise

Do conscious thoughts by themselves cause behavior? Two very different lines of research support an affirmative answer to this question. First, at a basic level of human functioning, Hochberg et al. (2012) demonstrated that paralyzed individuals can pick up a bottle of coffee and sip from it by moving a robotic arm with their mere thoughts. Second, following their extensive review of research, Baumeister et al. (2011) showed the evidence for conscious causation of behavior to be "profound" and "empirically strong." They noted that many of these effects are motivational, so that some conscious thoughts stimulate, but others inhibit, motivation. A good demonstration of such effects was reported by Senay, Albarracin, and Noguchi (2010) in four experiments on motivation of goal-directed behavior (exercise) through introspective self-talk. Testing the hypothesis that the linguistic structure of self-talk is likely to elicit thoughts that influence intentions and behaviors, the authors found that the interrogative form ("Will I" vs. "I will") used in self-talk led to stronger intentions to exercise and actual behavior. This research confirmed the idea that simple prompts ("Will I") can elicit conscious thoughts and influence how people think about a situation, and are therefore capable of motivating and altering behavior.

There is no paucity of evidence showing the effects of various cognitions and conscious thoughts on exercise intention and behavior, either. For example, outcome expectancy or thinking of costs (cons) and benefits (pros) of exercise predicts people's stages of readiness for exercise, and ultimately their exercise behavior (Marcus, Eaton, Rossi, & Harlow, 1994; Wankel & Thompson, 1977). Similarly, self-efficacy, or one's belief that she or he is capable of successfully completing a challenging task, predicts the maintenance of exercise behavior (e.g., Marcus et al., 1994), though not the initial adoption of exercise programs (Litt, Klempinger, & Judge, 2002). Perceived behavioral control, which is practically an identical construct to self-efficacy, has a significant positive relationship to exercise behavior, much more so than other components (attitude and subjective norm) of the theory of planned behavior (Armitage, 2005). Research (Schwarzer, 2001) has also shown the importance of social-cognitive factors in changing health behaviors in general, and exercise behavior in particular through the process of making people aware of their coping resources or self-regulatory skills. Accordingly, "action control" (which emphasizes constant awareness of standards and goals, self-monitoring, and self-regulatory effort) significantly reduces the exercise intention-behavior gap (Snihotta, Scholz, & Schwarzer, 2005).

Another area where the effects of conscious thoughts can be seen is at the intersection of cognitions and emotions. It is well established in social psychology that anticipated emotion, which

depends on conscious processing, affects motivation and behavior (Baumeister et al., 2011). The effect of anticipatory affect on exercise intentions has also been documented (French et al., 2005), and focusing on anticipated regret has been shown to result in stronger intentions to exercise in the future (Abraham & Sheeran, 2004). Evidence further indicates that affective associations with exercise mediate the effects of cognitive variables (e.g., perceived behavioral control) on physical activity (Kiviniemi, Voss-Humke, & Seifert, 2007). People's cognitions and feelings about exercise often intersect when they reflect on the outcomes and feedback they get from physical activity. Given the immediate and abundant feedback, it is almost impossible to avoid reflecting on what exercise does for oneself. "It is so hard to get going, but once I remember how good and energetic I feel afterward I get moving." Such thoughts and emotions are not uncommon and potentially play a significant role in decisions to engage in this behavior. When people consciously think about the contrast between their current condition and desired future states, their efforts and persistence tend to increase (Baumeister et al., 2011).

How people think about themselves has important consequences for their behavior. For example, friends and personal trainers often make such comments as, "you are really a dedicated exerciser" (Kendzierski, Furr, & Schiavoni, 1998). The resultant reflection and deliberation on personal self-definition as an exerciser has motivational effects on actual behavior (Kendzierski et al.). It has been shown that those who think of themselves as exercisers express greater affect and cognition (attitude and intention) toward exercise and actually participate more frequently and expend more calories in exercise programs than those who lack such self-schemata (Yin & Boyd, 2000). Thinking of oneself as an exerciser, therefore, translates into more physical activity. In addition, if people's conscious thoughts are focused on identifying themselves as "self as doers," they are much more likely to exercise than individuals who do not think of themselves as self as doers (Houser-Marko & Sheldon, 2006). The doer's main concern is with enacting the behavior, being concerned with present action, not with achievement of a particular outcome. The idea is to do something now rather than trying to arrive at a terminal end state in the future (e.g., lose a certain amount of weight).

### Self-Control and Self-Regulation

A related issue about conscious thoughts and behavior is self-control. A critical question is: "How does one pursue a goal offering larger long-run benefits when it conflicts with a temptation offering greater immediate rewards?" (Myrseth & Fishbach, 2009). This is exactly exercisers' and would-be exercisers' dilemma. Health and fitness benefits are not immediate but far in the future, and even then attainable only if the behavior is continuously maintained. In a society emphasizing instant gratification and individualism, exercise, with its demand for delay of gratification, is countercultural and counterindividualistic. Temptations for immediate gratification are numerous, convenient, and readily available. For exercisers, there is the lure of watching TV, surfing Internet, and playing video games among other things. According to Myrseth and Fishbach, identification of a conflict between indulging in temptations and pursuing higher-order goals is crucial for the deployment of successful self-control strategies. If people do not see a conflict between exercise and TV watching, for

example, there is no need for self-control. At a general level, self-control means increased motivation to pursue a goal and simultaneously, reduced motivation to pursue temptations. Goal pursuit is promoted, for example, by asymmetrically evaluating healthy and unhealthy options, bolstering the evaluation of goals and lowering the evaluation of temptations (Myrseth & Fishbach).

In essence, self-control is a self-regulation issue. Self-regulation is based upon commitment to high standards or goals, the monitoring of relevant behaviors, and the ability to inhibit competing or counterproductive responses and change behavior (Baumeister, Schmeichel, & Vohs, 2007). In this theoretical formulation, self-control is a finite cognitive resource that can be depleted through controlled and explicit acts of self-regulation, leading to what Baumeister, Bratslavsky, Muraven, and Tice (1998) call "ego depletion." As self-control strategies (e.g., bolstering the value of the higher goal) take up considerable cognitive resources, it is not surprising that self-control decreases with fatigue, negative affect, and concurrent activities (e.g., Baumeister et al., 1998). Research indicates that when self-control resources are low, people are more likely to resort to problem behaviors (e.g., cheating; DeBono, Shmueli, & Muraven, 2011) and by extension, suggests that "ego depletion" poses a particular problem for occasional exercisers. If they have been consuming their self-control resources during a day's stressful work, they are more likely to give in to temptations and forgo the day's exercise goal when arriving at home (Iso-Ahola, 2009). This would argue, other things held constant, for an early morning exercise routine before self-control resources are used up; many regular exercisers actually do so, unaware of the psychological benefit of doing it. A recent study on everyday desires and behaviors indirectly confirms this idea. Hofmann, Vohs, and Baumeister (2012) reported that the more recently and frequently people had been able to resist their earlier desires, the less successful they were in their subsequent attempts to control other desires. Nevertheless, more direct research is needed to examine the relationship between ego depletion and exercise behavior.

When self-regulatory efforts lead to ego depletion, they also result in reduced pain tolerance, less persistence, and lowered delay of gratification (Schmeichel & Vohs, 2009), which further complicates occasional exercisers' attempts to engage in a physically demanding and pain-inducing activity. On the other hand, these negative effects can be countered by making people, for example, think of their core values and goals (i.e., instructing them to "self-affirm"), thereby facilitating self-regulation (Schmeichel & Vohs, 2009). Another way to attenuate or prevent the effects of ego depletion is to increase self-regulatory capacity with repeated practice (Muraven, Baumeister, & Tice, 1999). Those who have become regular exercisers have experienced repeated success at self-regulation and have therefore increased their self-regulatory capacity with every completed exercise routine. In contrast, occasional exercisers, by definition, experience such success rarely, and in fact, may experience a sense of failure when realizing that they have not followed their exercise regimen.

Pursuit of abstract, long-term goals (e.g., staying healthy and fit) is often interfered with by short-term alternative goals or momentary temptations. Research on "goal shielding" has shown that mental representations of potentially competing goals can be inhibited by the mere activation of a primary goal (Shah, Friedman, & Kruglanski, 2002). This effect, however, occurs only for the

goals to which people are highly committed (Shah et al.). As such, “goal shielding” may be seen as part of the self-control process. For regular exercisers, priming the overarching goal of being healthy and fit, to which they are highly committed, “shields” them from conflicting goals and in this way, helps in controlling temptations. In fact, goal primes have been shown to inhibit activation of temptations (Fishbach et al., 2003). Occasional exercisers, on the other hand, do not consistently benefit from this shielding effect because of their lack of commitment to the higher level goal (Iso-Ahola, 2009). For them, the goal priming sometimes inhibits activation of temptations and sometimes does not. The end result is reduced self-control over the behavior and is manifested in reduced exercise frequency. This hypothesis, however, awaits empirical validation.

In goal pursuit, the occasional exerciser’s dilemma is twofold. He or she often experiences (a) competing goals and (b) competing means to achieve the same goal. For many, relaxation or stress relief becomes the primary goal after a day’s hard work, especially if self-control resources have recently and frequently been depleted (Hofmann et al., 2012); this goal often wins, as evidenced by the amount of time an average American spends watching TV (5 hr/day). Relaxation can further be justified by seeing it as a pursuit of the overarching goal in the name of mental rather than physical health. The overarching goal can also be pursued by competing means, such as eating health food. Chiou, Young, and Wan (2011) showed that eating health food is seen as another way of staying healthy and therefore supplants the need for exercise for achieving the focal goal. In short, occasional exercisers struggle in part because they not only have to block competing goals but also inhibit competing means for the same goal.

Danner, Aarts, and deVries (2007) reported that repeated retrieval of target means inhibits competing means from interfering with goal pursuit. Thus, inhibitory control is enhanced with repeated practice of target means in goal pursuit and “may play an important role in an early stage of the formation of goal-directed habits” (p. 1378). Extrapolating from this finding, I hypothesize that the more often one watches TV (target means) for stress relief or relaxation, the weaker is exercise as a competing means for achieving this goal. Further, the more often one exercises, the less likely TV watching is to come to mind, either as a competing goal or as a competing means. If these hypotheses are confirmed by empirical data, they will help us better understand the role of goal shielding and competing goals/means in differentiating occasional exercisers from regular exercisers.

People who are highly committed to their goals have strong intentions to attain them. Sheeran, Webb, and Gollwitzer (2005) provided evidence that implementation intentions were instrumental for achieving a goal when participants had strong goal intentions, but not when goal intentions were weak. These researchers further found that implementation intentions affected performance only when the relevant goal had been activated. This suggests that those would-be exercisers who lack strong goal intentions will not benefit from implementation intentions, much less so if a relevant exercise goal is not activated. Simply forming a counterhabitual implementation intention without a strong goal intention will not break an old habit, as “actual behavior will depart from habits only to the extent that individuals have strong alternative goal intentions” (Adriaanse, Gollwitzer, de Ridder, de Witt, & Kroese, 2011, p. 510). These authors’ data revealed that even when a habitual

response (e.g., watching TV) and an alternative response (e.g., exercise) have an equal chance of becoming an enacted behavior, the latter loses this “cognitive horse race” without a strong goal intention or commitment to exercise. Additional evidence (e.g., Adriaanse, de Ridder, & de Witt, 2009) indicates that for complex behaviors and for breaking unhealthy habits, implementation intentions have to specify motivational cues (i.e., “why” behavior is performed). Nonexercisers and occasional exercisers, with their weak goal intentions, are therefore more likely to benefit from such motivational cues than from situational cues (i.e., “where and when”). In fact, recent data indicate that simply asking people to write down what exercise means to them increases the frequency of strenuous exercise a week later (Iso-Ahola & Miller, 2012).

Reasons “why” one should exercise, however, are often countered by reasons why he or she cannot do it now. Survey after survey (e.g., Johnson et al., 1990) has shown that “lack of time” is the first and foremost reason why people say they do not exercise. At the same time, an average American spends about five hours watching TV every day (Nielsen, 2009), meaning that “lack of time” is not a real “barrier,” but an excuse for not exercising. Individuals have time, but resort to the often-repeated and “culturally learned stereotype” (Nisbett & Wilson, 1977), that people in general do not have time for exercise. It is known that people actively seek such excuses because, for one thing, they look for the path of least resistance (Kahneman, 2011). Moreover, people actively (consciously) overestimate their working hours and underestimate their leisure hours. Spayd (1995) reported that people who actually worked 55 hours a week estimated they spent 80 hours on the job. In accord with Bem’s (1972) self-perception theory, they begin to believe that, because they observe themselves to be busy, they must not have time for exercise. Consistent with this theorizing, Iso-Ahola and Miller (2012) found that activation of time saving (i.e., too busy to exercise) led to reduced exercise frequency one week later, suggesting that would-be exercisers are quick to adopt excuses for not being able to engage in this behavior.

Taken together, the reviewed evidence leaves little doubt that the initiation and maintenance of exercise behavior requires conscious effort, at least until one finally reaches the status of a regular exerciser. For most people most of the time, this behavior is difficult and complex, demanding a considerable amount of self-regulation and self-control. But as noted earlier, dealing with day-to-day life and its accompanying stresses depletes self-control capacity (Muraven & Baumeister, 2000), and therefore undermines people’s attempts to control and regulate their exercise involvement. Regardless of these inherent obstacles, however, there is a reason to believe that exercise promotion and treatment programs emphasizing self-regulation strategies can significantly improve exercise behavior (e.g., Anderson, Wojcik, Winett, & Williams, 2006). If these programs are based on specific goal setting, self-monitoring, stimulus-control procedures, and self-reinforcement they are likely to lead to increased and sustained exercise participation over a long period of time (e.g., Knapp, 1988). Social and interpersonal support needs to be part of this treatment package (Winett, 1998).

Intervention studies provide strong support for the positive effects of the conscious mind on exercise behavior. In general, individually tailored messages are more effective than untailored messages for bringing about changes in health behaviors (Kahn et al., 2002). Latimer et al. (2008) found that matching the exercise-

promoting messages with participants' "regulatory focus" (goal-orientation predisposition) led to more positive feelings and greater physical activity participation than nonfit messages. Lombard, Lombard, and Winett (1995) reported that the frequency of telephoning participants individually had a strong effect on their adherence to a walking program. Clearly, telephone prompting brought exercise to participants' conscious mind and therefore helped to sustain involvement in the long term. Research has shown that even larger community-based interventions aimed to promote physical activity are successful if they include intervention strategies at the individual level, such as pedometers used as self-monitoring and motivational tools (e.g., De Cocker, Bourdeaudhuij, Brown, & Cardon, 2007). On the other hand, mass media campaigns, although successful in changing attitudes toward physical activity and healthy eating, are not able to change actual behaviors (e.g., Beaudoin, Fernandez, Wall, & Farley, 2007). It is not surprising that general educational and media messages, whether on radio and TV or on buses, are not effective because they get lost among hundreds of other promotional ads and because they are not directed toward an individual's cognitions about exercise behavior.

The more specifically one's conscious thoughts on physical activity are targeted, the more likely they are to change actual behavior. Such interventions, however, can be too intrusive and therefore undermine an individual's sense of control and freedom (Iso-Ahola, 2009; Thompson & Wankel, 1980). Choice is the means by which people exercise control over the environment (Leotti & Delgado, 2011). Giving individuals choices is known to elicit an increased sense of personal control and lead to improved physical and mental health (Langer & Rodin, 1976). Individually tailored interventions, therefore, are likely to be successful if they focus on promoting personal freedom and control over exercise behavior.

## Freedom and Exercise

Autonomy, or freedom, is one of the most powerful variables in all of psychology, and the central concept in many influential theories in social psychology (e.g., cognitive dissonance, reactance, self-determination, and self-perception). It is hardly surprising, then, that autonomy has largely positive effects on individuals' motivation, behavior, health, and well-being (Patall, Cooper, & Robinson, 2008; Deci & Ryan, 2000), and that it has been qualified as one of the three basic human needs (Deci & Ryan, 2000). Recent evidence even indicates that the need for autonomy—and the need for choice—is biologically and neurologically based, suggesting that choice is valuable in and of itself (Leotti & Delgado, 2011). Choice allows people to pursue their values and express their identities (Grant & Schwartz, 2011), because it is linked with independence, control, and freedom from social constraints. Accordingly, individuals see themselves as independent agents who are in control of and responsible for their own actions. In short, choice has motivational consequences for human behavior and health. Given this general importance of autonomy, it follows that choice and freedom should play an important role in the initiation and maintenance of exercise behavior.

To fully understand the effects of freedom on exercise behavior, however, they have to be examined in the context of work and leisure. For most people, work provides little freedom; it is some-

thing that has to be done to survive. According to a survey of 5,000 households in the United States, more than half of all respondents disliked their jobs and would rather do something else (Gibbons, 2010). For them, work is a necessary evil, offering little or no sense of freedom. The resultant day-to-day routine or habitualness of work further undermines their sense of freedom. This is in sharp contrast to leisure, which people define overwhelmingly by the presence of freedom (Iso-Ahola, 1980). Freedom means not only freedom from work, but freedom to do nothing or freedom to do what one wants to do in his or her own time. It also means a choice between a necessary nonworking activity (e.g., mowing the lawn) and a favorite leisure activity (e.g., watching TV). Although freedom in leisure allows one to postpone mowing the lawn in favor of watching a TV program, such freedom hardly exists in work. Given the importance of freedom in general and in leisure in particular, any infringement on one's freedom in leisure is met with strong psychological resistance. Herein lies the problem for exercise. Because most people cannot exercise at their workplaces, their only time to do so is in leisure. But as Rosenwald (2006) concluded: "People are just not willing to give up their leisure time. They don't want to pay to exercise with their leisure time."

Where do people find freedom most readily? Studies have shown that individuals feel most free when engaged in leisure activities (Csikszentmihalyi & Graef, 1980). A long line of research has further revealed the centrality of freedom and choice, not only in people's definitions of leisure (Iso-Ahola, 1980), but also in how frequently they participate (Thompson & Wankel, 1980), whether they continue or quit (Chick & Roberts, 1989), how deeply they get absorbed in the activity (Mannell & Bradley, 1986), and how much they enjoy the experience (Csikszentmihalyi & Graef). Similarly, freedom and choice are central to exercise behavior. Experimental evidence indicates that people not only prefer more exercise choices (Vara & Epstein, 1993), but are more likely to adhere to exercise programs if they initially perceive choice over them (Thompson & Wankel, 1980). Further, autonomous motivation positively predicts moderate-intensity exercise bouts (Standage, Sebire, & Loney, 2008) and 3-year weight loss in women (Silva et al., 2011), and presenting exercise goals in an autonomy-supportive rather than controlling way results in greater persistence and energy expenditure (Vansteenkiste, Simons, Soenens, & Lens, 2004).

For any behavior to be sustained in the long run, it has to be based upon a sense of autonomy (Deci & Ryan, 2000). This, of course, means that exercise should be perceived as a choice, as an activity in which one has chosen to participate from among many others. To become a true choice, people not only have to be able to choose, but also feel that they do not have to choose, and that there are no consequences for not choosing to exercise (Iso-Ahola, 2009). Choosing not to watch TV has no or minimal consequences, whereas choosing not to exercise has serious consequences for one's health. This perception is mainly the result of how exercise has been sold to the masses: "Do it or otherwise . . .". Thus, exercise has become a "must" or "should" activity that sets up a confrontation between fitness activity and freedom on one hand and between fitness activity and leisure on the other, and in both cases, exercise loses (Iso-Ahola, 2009). It has been concluded, after a meta-analysis of studies on the effects of choice, that when the choice itself is presented in a way that includes pressure to pick a particular alternative, provision of choice is not beneficial (Patall

et al., 2008). All of this suggests that freedom becomes a major obstacle for exercise, and most people are not able to overcome it.

Because of the central importance of freedom in America, although this importance varies from culture to culture (Savani, Markus, Naidu, Kumar, & Berlia, 2010), and because of freedom's critical role in leisure, temptations in leisure take on added significance and therefore make it all the more difficult for exercise to compete against other leisure activities. Temptations are more than simple allurements; they are about one's sense of freedom and autonomy, leading to a constant cognitive battle or "cognitive horse race" between activity choices, especially among occasional exercisers. When these individuals weigh two options, such as going for a walk/run or watching TV, they are not only assessing the choice of exercise against a temptation but more importantly, the perceived obligation of exercise against a sense of freedom. It should not then be surprising that 54% of the population fails to exercise more than "occasionally." They frequently lose the cognitive horse race and give in to temptations in the name of freedom. If exercise is perceived as an activity that has to be done, it becomes another work-like routine and an extension of work, an antithesis of what freedom in leisure means. In this way, exercise becomes a threat to one's freedom and induces "psychological reactance," which in turn leads to attempts to restore the threatened freedom (Brehm & Brehm, 1981). For exercise, however, the problem is that attempts to restore freedom often mean indulging in temptations. Indulging in temptations restores freedom, but it is detrimental to goal pursuit (Leander, Shah, & Chartrand, 2009).

It should be noted that the problem is not with physical activity per se. In their classic study, Csikszentmihalyi and Graef (1980) showed that people feel most free when engaged in leisure activities, and most freedom-producing activities were sports and games, TV watching, and reading. Exercise, however, was not among these activities. Recreational sport is different from exercise because autonomy and intrinsic motivation are readily found in it, whereas exercise promotes a sense of "should" and work-like routine. Moreover, a sport activity (e.g., tennis) promotes freedom "within" it, as in more variety, rather than "same old, same old" in routine exercise.

All of the above suggests that to become a regular exerciser, one has to overcome freedom, or lack thereof, as an obstacle for exercise. Some people are able to do so, as demonstrated by the fact that 22% of the population exercises regularly. Figure 1 presents a theoretical model that proposes how exercisers and nonexercisers differ in the way they experience this perceived freedom process and why they end up with an opposite outcome (Iso-Ahola, 2009). Initially, regular exercisers perceive exercise as a nonchoice, having made a conscious decision that it has to be done daily like brushing teeth. Research has shown that those who are highly committed to their goal will suppress their desire to restore a sense of personal freedom (Fishbach & Dhar, 2005). Since they likely perceive exercise to take only an insignificant part of their leisure time, it has no consequences for their sense of freedom. Concomitantly, their commitment to the overarching goal of staying fit and healthy helps them cultivate their interest in and liking for this activity, as well as develop expertise in it, which increases their sense of competence, and thus intrinsic motivation. With time, through this process, exercise comes to be perceived as an authentic choice, an expression of oneself. The net result is sustained exercise involvement.

In this process, a person's sense of self is linked with the mere doing of exercise behavior, not with any benefits or outcomes to be obtained from it. This "self-as-doer" identity (Houser-Marko & Sheldon, 2006) is a motivational resource that is likely to play an important role in efforts to overcome or eliminate the issue of freedom about exercise. Accordingly, the doer's main concern is with enacting the behavior, being concerned with present action, not with achievement of a particular outcome. People focus on themselves as individuals who are able to enact their behaviors no matter what. They do not think of exercise as an activity that violates their personal freedom or as an activity that undercuts their leisure. It is also likely that selves as doers are "mindful" individuals who are aware of and pay close attention to their inner experiences (e.g., emotions) and external events, and are therefore more capable of acting on their intentions. Chatzisarantis and Hagger (2007) showed that the relationship between intention and exercise behavior was significantly stronger in mindful than in

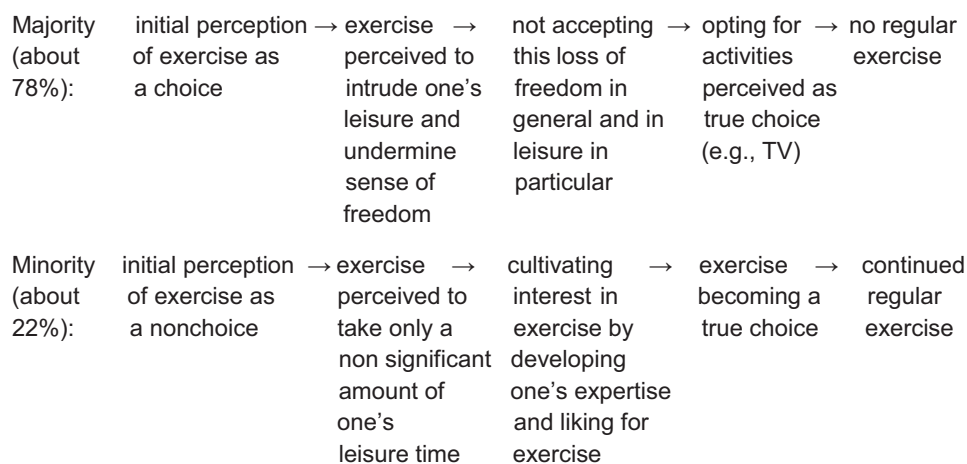


Figure 1. Role of perceived freedom in the decision-making process about exercise among exercisers (minority) and nonexercisers (majority). From Iso-Ahola, 2009.

unmindful individuals. Like selves as doers, mindful persons are in control of their emotions and cognitions and have the ability to self-regulate their behaviors. They are able to stay focused on the achievement of their goals. In short, selves as doers and mindfulness are important motivational and cognitive resources for attempts to overcome the obstacles that the lack of a sense of freedom poses for exercise (Iso-Ahola, 2009).

Nonexercisers, on the other hand, struggle with their sense of freedom and exercise. Initially, they perceive exercise as one choice among many leisure activities, but the “you-should-do-it” nature of exercise severely undermines the sense of freedom to engage in this activity. The resultant psychological reactance (Brehm & Brehm, 1981) is to fight losing this sense of freedom and instead, opt for activities that are seen as true choices. The final outcome is that exercise is perceived as a nonchoice and is therefore not sustained on a regular basis. Although the need for autonomy is one of three basic human needs (Deci & Ryan, 2000), the problem is that it can readily be satisfied by nonexercise means. Even choosing to do nothing in one’s leisure is an expression of autonomy, as is a choice to engage in passive activities. Thus, from the perspective of trying to satisfy one’s need for autonomy, exercise provides nothing unique psychologically and does not therefore prod or compel nonexercisers to exercise.

The importance of freedom and choice is seen in the finding that activating the concept of choice has powerful effects on individual perceptions in general, and interpersonal judgments in particular. Savani, Stephens, and Markus (2011) reported that priming the concept of choice decreased support for policies promoting interpersonal equality, increased victim blaming, and decreased empathy for disadvantaged people. A corollary of these findings is that such activation of choice makes people aware of the importance of individual freedom and control and potential threats to them. External events, information, and promotions that suggest that people should (or should not) behave in certain ways activate the concept of choice and therefore make them sensitive to the possible loss of individual freedom; this activation of freedom then gives rise to reactance (Brehm & Brehm, 1981). Constant bombardment by information that “you should exercise” activates the sensitivity to issues of choice in a negative way, and ironically, contributes to making the sense of freedom a major obstacle for exercise.

Exercise and diet are trumpeted as the keys to solving the enormous societal and individual problem of obesity in the Western world, especially in the United States. However, people who take up exercise for this purpose are not doing it as a personal choice but as a means toward an ulterior end. The “overjustification” research over the last 40 years has shown compellingly that extrinsic contingencies undermine human motivation (Deci, Koestner, & Ryan, 1999). Therefore, to exercise in order to lose weight is to do it for a wrong reason, that is, to achieve an extrinsic reward. In general, behavior can be sustained in the long run only by intrinsic rewards, most notably if a behavior is done as an expression of personal choice (Deci & Ryan, 2000). A sense of freedom and choice enhances intrinsic motivation, effort, and persistence (Patall et al., 2008), and is neurologically based and valuable in and of itself (Leotti & Delgado, 2011). In a similar vein, intrinsic motivation and freedom are positively associated with exercise, as evidenced by both cross-sectional (e.g., Standage et al., 2008) and experimental research (e.g., Vans-

teenkiste et al., 2004). The latter study showed that framing an exercise goal in an intrinsically motivating and autonomy-supportive way enhanced effort expenditure and long-term persistence in the exercise activity.

All of this suggests that exercise is not a viable tool for most people in their efforts to lose weight. It is well documented that 50% of people who start an exercise program drop out after six months (Dishman & Buckworth, 1997). Their senses of autonomy, and thus motivation, are undermined because of the pressure to pick a particular alternative (exercise) and because choosing between the options is effortful. In general, a sense of freedom is higher when choosing between options that are similar in attractiveness and effort required (Schwartz, 2004). In theory, although to be proven empirically, the choice between watching TV and exercising, for example, is effortful because these options have differing consequences, making them dissimilar in attractiveness. If this choice is indeed effortful, people will always, according to Kahneman’s (2011, p. 35) theory of “the law of least effort,” “gravitate to the least demanding course of action,” in this case TV watching. Consistent with this idea, experimental research (Vara & Epstein, 1993) has shown that people generally not only choose a sedentary activity over exercise, but choose a sedentary activity even if they have a choice between one sedentary activity and multiple exercise options. This general tendency to follow the path of least resistance is further facilitated by the leisure industry’s success in promoting home entertainment systems and other passive forms of leisure. (Iso-Ahola & Mannell, 2004). That people search for the path of least resistance in pursuing their overarching goal of staying fit and healthy was also demonstrated by Chiou et al.’s (2011) experiments on how dietary supplements actually contribute to, or “license,” health-risk behaviors. Their data showed that participants who took what they believed were dietary supplements expressed less desire for exercise (and more desire for hedonic activities) and actually walked shorter distances for exercise. Thus, vitamin pills can be seen as a substitute for exercise and as a shortcut for health.

Cognitive dissonance further helps us understand why people are quick to choose the path of least resistance. The cognitive dissonance process (Festinger, 1957), which is involved in how and why people make the choices they do, makes it difficult for those who struggle with their decision to exercise. Consider two primary cognitions that are dissonant in one’s mind: (a) I know exercise is good for me, and (b) I don’t exercise regularly. According to Festinger, this state of dissonance has to be resolved. When it is not resolved behaviorally by starting to exercise, it can be eliminated cognitively, for example, by pointing out that Winston Churchill smoked cigars, drank whiskey daily, and never exercised, yet lived for more than 90 years. Another convenient cognitive way is to use an excuse that exercise “takes too much time.” Indeed, survey after survey has shown that a lack of time is by far the most important reason for not exercising (e.g., Johnson et al., 1990; Rhodes & Plotnikoff, 2006). This rationalization not to exercise by invoking excuses for it is a convenient way to reduce dissonance and is supported by the finding that when time saving is activated, involvement in exercise activity is reduced (Iso-Ahola & Miller, 2012), implying that people are quick to accept the lack of time as a rationalization for not exercising. This research, however, is in its early stages, and much more evidence

is needed before firm conclusions can be drawn on how dissonance reduces exercise.

The dissonance effect is also seen in public pledges people make about their exercise behavior. In their classic experiment, Aronson, Fried, and Stone (1991) showed that health behaviors (e.g., engaging in unsafe sex) can markedly be changed through the process of cognitive dissonance by making people feel like hypocrites. Bator and Bryan (2007) tested this idea in the context of exercise behavior. They demonstrated that when people were reminded that they were not living up to their own preaching (i.e., they were hypocrites), they subsequently used a fitness center far more regularly than participants who were not made to feel hypocritical. By living up to their commitments and pledges, people were able to avoid feeling cognitively dissonant and hypocritical, thereby resolving dissonance by behavioral means (i.e., increasing their exercise involvement). In general, dissonance reduction is another form of controlled and explicit self-regulation, which, as discussed earlier, is a limited resource that can be considerably depleted (Baumeister et al., 1998). Taken together, the above evidence suggests that, if dissonance is reduced by cognitive means, exercise decreases, but if it is resolved by behavioral means, exercise increases. Future research has to determine when and under what conditions people use cognitive versus behavioral means to solve their dissonance about exercise.

All in all, both theory and empirical evidence leave little doubt that the conscious mind and thoughts are primary determinants of most people's decisions to exercise or not to exercise. The fact that exercise poses physical, mental, and social demands triggers the cognitive process and conscious thinking about whether to engage in this behavior. As discussed, much of this process revolves around one's cognitions and feelings about freedom and choice, which do not occur in a social vacuum. For example, because of child care, spouses have to negotiate who is free to exercise and when. In addition, the "you-should-do-it" nature of exercise causes psychological reactance and attempts to restore the threatened freedom often through indulging in temptations (Leander et al., 2009). Thus, freedom and choice constitute a cognitive threshold over which one has to be able to climb in order to repeat an exercise activity day after day and ultimately relegate it to the nonconscious mind. However, the fact that 22% of the population is able to do it demonstrates that the task is possible, albeit formidable, if not insurmountable, to most (78%).

### Nonconscious Versus Conscious Mind and Exercise

There is no question that nonconscious processes can influence goal pursuit (Custers & Aarts, 2010). Empirical evidence is strong, although it is almost exclusively based on research conducted on simple laboratory tasks. Similarly, evidence for the causal effects of conscious thoughts is "strong" and "profound" (Baumeister et al., 2011) and has been documented in a vast array of behaviors. Clearly, then, it is an overexaggeration to state that 99% of human reactions are nonconscious (Bargh, 1997) and that there is no role for consciousness in human behavior (Dijksterhuis et al., 2007). Even if most of our responses are dominated by "fast thinking" (nonconscious) and intuitive thoughts (Kahneman, 2011) because of cognitive simplicity and habitualness of everyday life, many behaviors are complex and demanding and therefore require "slow" and deliberate thinking. Exercise is such a behavior. The

theory of unconscious goal pursuit (Custers & Aarts, 2010) posits that cues in social situations can prime mental representations of (exercise) goals, and thereby unconsciously prepare the brain and the mind for relevant behaviors. Accordingly, seeing a jogger in a neighborhood primes the overarching goal of staying fit and healthy and creates positive affective associations with exercise among exercisers, but negative affective associations among non-exercisers (Bluemke et al., 2010). In short, exercise primes appear to benefit only those who have repeated this behavior countless times in the past, but are likely to hurt those who have not done so. If confirmed by further evidence, this is an important finding because it shows that nonconscious priming has a limited effect on motivating exercise and suggests that exercise behavior must have been repeated for a long time before the nonconscious mind can take control of it (Neal et al., 2006; Wood et al., 2005).

Seeing a jogger in a neighborhood is a psychological problem (i.e., negative affective association) for nonexercisers (Bluemke et al., 2010) because, I propose, this cue increases sensitivity to individual choice and freedom on one hand (Savani et al., 2011) and creates cognitive dissonance on the other, reminding them—unconsciously or consciously—that they, too, *should* exercise. The resultant affront to freedom arouses "reactance" (Brehm & Brehm, 1981) and a conscious suppression of thoughts (Wegner, 1994) about exercise, leading to attempts to restore freedom through other means or temptations. Such cues, on the other hand, are beneficial for exercisers, because they are no longer sensitive to choice and freedom about exercise (see Figure 1), thereby making the nonconscious mind the driver of their exercise behavior. This theoretical formulation, however, awaits empirical validation and systematic experimentation. Spelling out the role of freedom and cognitive dissonance in exercise behavior will make the picture clearer about the influence of both the nonconscious and conscious mind. Presently, we know little about the interactive effects of nonconscious intuitions and conscious thoughts on behavior, especially about the conditions under which conscious processing overrides automatic and nonconscious impulses.

Nevertheless, research suggests that for complex behaviors (e.g., physical activity for occasional exercisers), the influence of nonconscious processes is quite limited. At best, these processes can be expected to prime relevant goals, but be unable to turn them into actual behaviors. Instead, active and conscious self-regulation is needed to turn unconscious thoughts into action (Baumeister et al., 2011; Gollwitzer, Sheeran, Trötschel, & Webb, 2011). In this process, the presence or absence of choice is important because it influences people's abilities to self-regulate their behaviors (Leotti & Delgado, 2011). These considerations suggest that conscious thoughts are likely to be more effective than nonconscious thoughts in affecting actual exercise behaviors. They also raise an intriguing possibility that nonconscious processes may be more effective in subliminally priming people *not* to exercise (e.g., through the acceptance of excuses) than to prompt them to exercise. That is, because people are generally inclined to shun complex and demanding tasks and follow the "law of least effort" (Kahneman, 2011), and because their nonconscious minds readily adopt environmental cues for time saving (Zhong & DeVoe, 2010), it can be expected that the nonconscious mind is more oriented against exercise than for it. These hypotheses were recently tested in two experiments (Iso-Ahola & Miller, 2012).

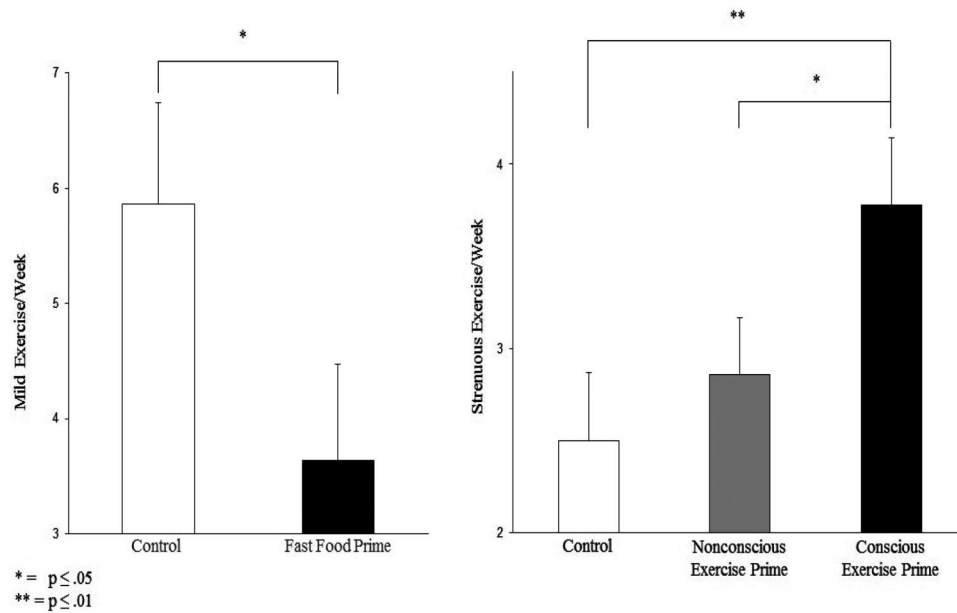


Figure 2. Effects of nonconscious priming on exercise behavior (left panel) and effects of nonconscious and conscious priming on strenuous exercise (right panel). From Iso-Ahola & Miller, 2012.

Consistent with Zhong and DeVoe's (2010) findings, results of the first experiment showed that priming time saving through fast-food logos decreased exercise frequency (see Figure 2). Non-conscious thinking of fast food makes people impatient and oriented toward time saving (Zhong & DeVoe). Given the plethora and ubiquity of cultural and situational cues for time saving, it is not surprising that people readily jump into an excuse of not having time for exercise when given an opportunity for it. The second experiment tested the relative effectiveness of nonconscious priming of exercise-related objects (e.g., Nike and Under Armor logos) with conscious priming (i.e., think and write down what exercise means to you), and revealed (see Figure 2) that the latter significantly increased exercise frequency, whereas the former failed to do so. This provides tentative evidence that conscious thoughts are needed to turn the nonconscious representation of exercise goals into action. As noted, exercise is a complex and demanding behavior that poses difficult questions for those who contemplate initiating it, such as "Can I do it"? To solve these kinds of problems requires "slow" and deliberate (conscious) thinking (Kahneman).

Ubiquity of symbols of time saving is so overwhelming and overriding that other messages have little chance to occupy our unconscious minds. Can anything be done against this onslaught? Gollwitzer et al.'s (2011) research offers one potentially useful cognitive mechanism or system, which is self-regulation of non-conscious priming effects before they occur. Their three experiments showed that to protect against the antagonistic-behavior priming effects, the formation of if-then plans or implementation intentions is an effective self-regulatory tool for shielding ongoing goal pursuits from negative priming effects. In other words, it is possible for people to self-regulate or preempt the unwanted influence of behavior primes by spelling out beforehand how and when the intended behavior will be carried out. This means that

conscious thoughts are necessary for reining in the permeating influence of behavior (nonconscious) primes, which in turn demonstrates that the nonconscious and conscious minds are inextricably interwoven in goal pursuit. As Gollwitzer et al. concluded, "by forming implementation intentions, people submit their subsequent goal striving to the direct control of situational cues" (p. 906). It is this marriage and interplay of the two minds that occasional exercisers seek to establish, but find it a formidable challenge. They first have to overcome their own pervasive tendency to follow the nonconscious mind's default system for intuitive and least effortful actions. Formation of if-then plans, on the other hand, requires considerable conscious processing and practice. Necessity for the nonconscious and conscious mind to work together and complement each other underscores the fact that exercise is as much a cognitive as it is a physical challenge.

### Cognitions and Exercise: Reciprocal Effects

Finally, it should be noted that not only do conscious thoughts determine exercise, but physical activity affects cognitions and cognitive functioning as well. More specifically, exercise markedly improves cognitive functioning and the lack of it does the opposite (e.g., Colcombe & Kramer, 2003). Particularly notable are the effects of exercise on executive function, which is responsible for multitasking, working memory, decision making, problem solving, and planning. These tasks of the executive-control process do not become automatic over time, because they require constant mediation by a central executor, that is, consciousness (Colcombe & Kramer, 2003). The literature further provides evidence for a "relatively robust" effect of physical activity training on cognitions and suggests that a more efficient neural process is associated with such training in older adults (Hertzog, Kramer, Wilson, & Lindenberger, 2009). Even relatively short bouts of skill performance and

exercise intervention have been observed to lead to a significant increase in gray matter (e.g., [Bezzola, Merillat, Gaser, & Jäncke, 2011](#)). Animal studies ([Hertzog et al.](#)) have shown other morphological changes in brain structure as a result of physical activity, such as an increase in the production of neuropeptide Y (NPY) and brain-derived neurotrophic factor (BDNF) in the hippocampus. These proteins are important for the survival of existing neurons and most remarkably, for the generation of new neurons. Such findings led [Hertzog et al. \(2009\)](#) to propose “the neurogenic reserve hypothesis,” according to which “exposure and training at younger ages builds a hippocampal neurogenic reserve for cellular and functional plasticity in old age” (p. 32).

It should further be noted that attainment of the neuroplasticity benefits of exercise does not necessarily require hard and strenuous physical activity. [Bezzola et al. \(2011\)](#) reported that training significantly increased the density and intensity of gray matter in novice golfers when they were compared with controls. These effects were immediate and did not depend on training protocols, schedules, or instruction. All the participants achieved the benefits even though they accumulated training hours at a varying individual pace. However, the training intensity had a significant effect, in that those who completed the set hours of training (40 hrs) faster and who became more skillful evidenced greater benefits in gray matter than those who progressed more slowly. Overall, this and other studies “point to neuronal adaptations resulting from being active during leisure time” (p. 12,446).

Taken together, the above research raises a real possibility that those who do not exercise lose out on neuroplasticity and neurogenesis on one hand and cognitive functioning on the other. Such negative effects are far reaching and suggest that the lack of exercise and physical activity contributes to cognitive decline and makes decisions on the initiation and maintenance of exercise involvement even more difficult. The resultant downward spiral feeds into itself and leads to even less exercise. It is not, then, a stretch to hypothesize that reduced executive functioning means greater difficulty in planning and making decisions on exercise participation, especially in older age. This provides yet another reason for starting physical activity at a young age. Continuous exercise contributes to improved cognitive functioning, which in turn leads to better decisions about protecting one's health.

## Conclusion

The fact that 78% of the U.S. population does not exercise regularly, despite the well-documented health-benefits ([Blair, 1993](#); [Lee et al., 2012](#)), although 22% does so, is an interesting scientific and psychological problem. One way to understand this problem is to examine the role of the nonconscious and conscious mind in exercise behavior. Do conscious thoughts cause behavior in general and exercise behavior in particular? If they do, why do most people's cognitive decisions lead to failures to exercise? Or, is human behavior primarily driven by the nonconscious, even to the point that “there is no role for consciousness” in it ([Dijksterhuis et al., 2007](#))? If so, why does it fail to make people regular exercisers?

Although there generally is no question about the effect of the nonconscious mind on human behavior ([Custers & Aarts, 2010](#)), much of the evidence is based upon simple laboratory tasks, which have ignored complex and real-life behaviors. There is a monu-

mental difference in the role of the nonconscious between performing a simple choice task in a laboratory and going to a gym to play racquetball. Even simple motor behaviors (e.g., walking) as forms of exercise often become cognitively complex due to the demands and allures of daily social situations, which makes the control of these seemingly simple activities fall outside the purview of the nonconscious mind. Even if we accept the idea that “behavioral impulses” are first generated nonconsciously in the brain ([Bargh & Morsella, 2008](#)) and that the resultant “unconsciously operating motives” guide exercise behavior, a major problem arises from weak cue-behavior associations. Because exercise has not been repeated frequently enough in stable contexts ([Wood et al., 2005](#)), conscious processes have to become heavily involved in directing behavioral approach and avoidance tendencies, thereby reducing or eliminating the effect of the nonconscious mind on the initiation and maintenance of this complex behavior ([Baumeister et al., 2011](#)). At best, nonconscious processes can be expected to prime relevant health and fitness goals, but be unable to turn them into actual behaviors. Although there is evidence that exercisers have positive affective associations with exercise in their nonconscious minds, nonexercisers have negative affective associations with exercise ([Bluemke et al., 2010](#)). This means that situational cues (e.g., seeing a jogger) help only regular exercisers, but are likely to unconsciously hurt nonexercisers and their goal pursuit of staying healthy through exercise. Evidence further suggests that regular exercisers, whose cue-behavior associations are strong, largely operate on subliminal exercise-related primes and “unconscious motives” ([Neal et al., 2006](#)). The challenge for nonexercisers and occasional exercisers, of course, is how to get to this point.

Because the nonconscious mind in and of itself is incapable of creating sufficiently strong behavioral impulses that would override everything else to make most of us daily exercisers ([Miller et al., 2011](#)), the conscious mind has to get heavily involved. There is tentative evidence to suggest that the nonconscious mind may be more inclined to search for excuses *not* to exercise than reasons to engage in this behavior ([Iso-Ahola & Miller, 2012](#)). This effect, if further confirmed, likely arises from the interaction effect of person and environment: (a) the human tendency to follow the “law of least effort” ([Kahneman, 2011](#)) and (b) ubiquitous cues for time saving in social environments and accompanying priming effects that permeate all aspects of everyday life ([Zhong & DeVoe, 2010](#); [Gollwitzer et al., 2011](#)). However, research in this area is in its early stages and much more of it is needed to elucidate how unconscious processing works against goal pursuit in health behaviors.

A vast array of research leaves no doubt that conscious thoughts determine human behaviors, more so with complex behaviors ([Baumeister et al., 2011](#)), nor is there a paucity of evidence for the effects of conscious thoughts on exercise intentions and behaviors. These effects include, but are not limited to, the linguistic structure of self-talk and prompts (“Will I?”), outcome expectancies of costs and benefits, reflections on a personal self-definition as an exerciser, beliefs in personal control and efficacy, and individually tailored messages and programs emphasizing self-regulation strategies for exercise ([Armitage, 2005](#); [Kendzierski et al., 1998](#); [Marcus et al., 1994](#); [Senay et al., 2010](#)). Further, affective associations and anticipated emotions (e.g., regret), which depend on

conscious processing, influence exercise motivation and behavior (Abraham & Sheeran, 2004).

Cognitive processes involving self-control and self-regulation are at the heart of decisions to engage in certain behaviors, in particular when pursuit of a long-term goal with large benefits is in conflict with temptations offering immediate rewards (Myrseth & Fishbach, 2009). Resolving this conflict by resisting temptations and instant gratification requires considerable self-control resources, which can be depleted by previous cognitions and actions (Baumeister et al., 1998). If these resources have been consumed frequently and recently (Hofmann et al., 2012), it is easier to give in to temptations and forgo the day's exercise goal. The relationship between "ego depletion" and exercise, however, has not been directly investigated and therefore remains a fruitful area for future research. On the other hand, the "self-as-doer" and "mindfulness" predispositions, which are enduring personal resources in aid of self-control, have been studied and found positively related to exercise behavior (Houser-Marko & Sheldon, 2006).

A considerable self-control problem arises from a perceived loss of freedom in exercise. Physical activity is a threat to one's sense of freedom and choice, because it is typically promoted as a "you-must-do-it" activity. The resultant psychological reactance leads to attempts to restore this freedom (Brehm & Brehm, 1981), and it is often accomplished by giving in to temptations. Although indulging in temptations restores freedom, it is detrimental to goal pursuit (Leander et al., 2009). Thus, perceived freedom becomes a formidable impediment to exercise behavior. The experimental evidence that initial choice improves long-term adherence to exercise programs attests to the importance of a sense of autonomy or freedom (Thompson & Wankel, 1980). Autonomous motivation also predicts moderate-intensity bouts and 3-year weight loss (Silva et al., 2011). Further, presenting exercise goals in an autonomy-supportive rather than controlling way results in greater persistence and energy expenditure (Vansteenkiste et al., 2004).

Seeing exercise as a "you-should-do" activity not only undermines a sense of freedom, but likely creates cognitive dissonance in nonexercisers ("Exercise is good for me" vs. "I don't exercise"). Because people do not resolve this conflict by behavioral means (i.e., 78% fail to exercise), they resort to cognitive rationalization by embracing excuses for it ("It takes too much time"). Preliminary experimental evidence suggests that the nonconscious activation of time saving reduces exercise frequency, presumably because it offers a convenient excuse for not having time for exercise (Iso-Ahola & Miller, 2012). On the other hand, reminding people about their pledges for exercise increases their exercise behaviors (Bator & Bryan, 2007), because it enables them to avoid feeling dissonant and hypocritical. Much more research, however, is needed to better understand the role of freedom and cognitive dissonance in exercise behavior.

Since situational cues can unconsciously activate freedom and dissonance about exercise and associated excuses, it is important to know how conscious processing can in turn override and interrupt such automatic activation. Research (Gollwitzer et al., 2011) suggests that the formation of if-then plans or implementation intentions is an effective self-regulatory mechanism for protecting ongoing goal pursuits from the unwanted influence of nonconscious behavior primes. Whether and how people can preempt and self-regulate nonconscious priming effects before they occur in exercise contexts remains to be determined. This is an important area

for research because it can elucidate how nonexercisers may be helped to fight against the onslaught of negative situational and behavioral primes in everyday social environments.

Some individuals (22%) have been able to overcome the freedom obstacle. Because of their self-control resources, they have made conscious decisions to engage in exercise behaviors, regardless of circumstances (Houser-Marko & Sheldon, 2006). These "selves as doers" do not think of exercise as an activity that violates their personal freedom or leisure. After many repeats, their conscious minds relegate or relinquish control of the behavior to the nonconscious mind and automatic habit (Wood & Neal, 2007). Relevant situational cues activate in the nonconscious the enduring and abstract goal of staying fit and healthy, and as a result, the nonconscious is in charge of the behavior. It should be remembered, however, that conscious thoughts are never far away, as regular exercisers' activity can easily be disrupted by changes in stable environments (Wood et al., 2005). Conscious thoughts are needed to rescue the nonconscious mind from failing to keep the behavior on its automatic path. In such situations, "the behavioral outcome depends crucially on what happens when impulses to act are contemplated consciously" (Baumeister et al., 2011, p. 334).

All in all, exercise poses a major challenge for both the conscious and nonconscious mind. Although people recognize fitness and health as important human conditions, they often pursue these goals by employing exercise as a means toward another end (e.g., to lose weight). In doing so, they struggle cognitively with their need for autonomy while trying to balance it in interpersonal and leisure contexts. Such struggles deplete finite self-control resources and make them vulnerable to temptations. Even if people realize that they do not exercise, though "they should," the resultant cognitive dissonance is often solved by cognitive rather than behavioral means. Nonconscious primes and excuses for not exercising are convenient and readily available in social environments. In this way, the nonconscious mind actively works against goal pursuit in exercise contexts and makes the task for the conscious mind even more difficult. On the other hand, regular exercise is not an impossible outcome, as 22% of the United States population is achieving this objective daily. For the vast majority, however, the task is a difficult, if not insurmountable, challenge. Difficulty stems from their failures to realize and harness the interactive powers of the nonconscious and conscious mind.

## References

- Aarts, H., Gollwitzer, P., & Hassin, R. (2004). Goal contagion: Perceiving is for pursuing. *Journal of Personality and Social Psychology*, 87, 23–37. doi:10.1037/0022-3514.87.1.23
- Abraham, C., & Sheeran, P. (2004). Deciding to exercise: The role of anticipated regret. *British Journal of Health Psychology*, 9, 269–278. doi:10.1348/135910704773891096
- Adriaanse, M. A., De Ridder, D., & De Witt, J. (2009). Finding the critical cue: Implementation intentions to change one's diet work best when tailored to personally relevant reasons for unhealthy eating. *Personality and Social Psychology Bulletin*, 35, 60–71. doi:10.1177/0146167208325612
- Adriaanse, M. A., Gollwitzer, P., De Ridder, D., De Witt, J., & Kroese, F. (2011). Breaking habits with implementation intentions: A test of underlying processes. *Personality and Social Psychology Bulletin*, 37, 502–513. doi:10.1177/0146167211399102
- Albarracín, D., Hepler, J., & Tannenbaum, M. (2011). General action and inaction goals: Their behavioral, cognitive, and affective origins and

- influences. *Current Directions in Psychological Science*, 20, 119–123. doi:10.1177/0963721411402666
- Anderson, E. S., Wojcik, J., Winett, R., & Williams, D. (2006). Social-cognitive determinants of physical activity: The influence of social support, self-efficacy, outcome expectations, and self-regulation among participants in a church-based health promotion study. *Health Psychology*, 25, 510–520. doi:10.1037/0278-6133.25.4.510
- Armitage, C. J. (2005). Can the theory of planned behavior predict the maintenance of physical activity? *Health Psychology*, 24, 235–245. doi:10.1037/0278-6133.24.3.235
- Aronson, E., Fried, C., & Stone, J. (1991). Overcoming denial and increasing the intention to use condoms through the induction of hypocrisy. *American Journal of Public Health*, 81, 1636–1638.
- Baars, B. J. (2002). The conscious access hypothesis: Origins and recent evidence. *Trends in Cognitive Sciences*, 6, 47–52. doi:10.1016/S1364-6613(00)01819-2
- Bargh, J. (1997). Reply to the commentaries. In R. Wyer (Ed.), *Advances in social cognition* (Vol. 10, pp. 231–246). Mahwah, NJ: Erlbaum.
- Bargh, J. A., Gollwitzer, P. M., Lee-Chai, A., Barndollar, K., & Trötschel, R. (2001). The automated will: Unconscious activation and pursuit of behavioral goals. *Journal of Personality and Social Psychology*, 81, 1014–1027. doi:10.1037/0022-3514.81.6.1014
- Bargh, J. A., & Morsella, E. (2008). The unconscious mind. *Perspectives on Psychological Science*, 3, 73–79. doi:10.1111/j.1745-6916.2008.00064.x
- Bator, R. J., & Bryan, A. (2007, August). Revised hypocrisy manipulation to induce commitment to exercise. Poster presented at the annual conference of the American Psychological Association. San Francisco, CA.
- Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology*, 74, 1252–1265. doi:10.1037/0022-3514.74.5.1252
- Baumeister, R. F., Masicampo, E., & Vohs, K. (2011). Do conscious thoughts cause behavior? *Annual Review of Psychology*, 62, 331–361. doi:10.1146/annurev.psych.093008.131126
- Baumeister, R. F., Schmeichel, B., & Vohs, K. (2007). Self-regulation and the executive function: The self as controlling agent. In A. Kruglanski, & E. Higgins (Eds.), *Social psychology: Handbook of basic principles* (2nd ed., pp. 516–539). New York, NY: Guilford Press.
- Baumeister, R. F., Vohs, K. D., & Funder, D. C. (2007). Psychology as the science of self-reports and finger movements: Whatever happened to actual behavior? *Perspectives on Psychological Science*, 2, 396–403. doi:10.1111/j.1745-6916.2007.00051.x
- Beaudoin, C. E., Fernandez, C., Wall, J., & Farley, T. (2007). Promoting healthy eating and physical activity, short-term effects of a mass media campaign. *American Journal of Preventive Medicine*, 32, 217–223. doi:10.1016/j.amepre.2006.11.002
- Bem, D. (1972). Self-perception theory. *Advances in Experimental Social Psychology*, 6, 1–62. doi:10.1016/S0065-2601(08)60024-6
- Bezzola, L., Merillat, S., Gaser, C., & Jäncke, L. (2011). Training-induced neural plasticity in golf novices. *The Journal of Neuroscience*, 31, 12444–12448. doi:10.1523/JNEUROSCI.1996-11.2011
- Bijleveld, E., Custers, R., & Aarts, H. (2012). Human reward pursuit: From rudimentary to higher-level functions. *Current Directions in Psychological Science*, 21, 194–199. doi:10.1177/0963721412438463
- Blair, S. N. (1988). Exercise within a healthy lifestyle. In R. Dishman (Ed.), *Exercise adherence: Its impact on public health* (pp. 75–89). Champaign, IL: Human Kinetics.
- Blair, S. N. (1993). Physical activity, physical fitness, and health. *Research Quarterly for Exercise and Sport*, 64, 365–376.
- Bluemke, M., Brand, R., Schweizer, G., & Kahlert, D. (2010). Exercise might be good for me, but I don't feel good about it: Do automatic associations predict exercise behavior? *Journal Sport & Exercise Psychology*, 32, 137–153.
- Blumenthal, J. A., Babyak, M. A., Doraiswamy, P. M., Watkins, L., Hoffman, B. M., Barbour, K. A., . . . Sherwood, A. (2007). Exercise and pharmacotherapy in the treatment of major depressive disorder. *Psychosomatic Medicine*, 69, 587–596. doi:10.1097/PSY.0b013e318148c19a
- Brehm, S., & Brehm, J. (1981). *Psychological reactance: A theory of freedom and control*. London, UK: Academic Press.
- Chatzisarantis, N. L., & Hagger, M. (2007). Mindfulness and the intention-behavior relationship within the theory of planned behavior. *Personality and Social Psychology Bulletin*, 33, 663–676. doi:10.1177/0146167206297401
- Chick, G., & Roberts, J. (1989). Leisure and antileisure in game play. *Leisure Sciences*, 11, 73–84. doi:10.1080/01490408909512208
- Chiou, W.-B., Yang, C.-C., & Wan, C.-S. (2011). Ironic effects of dietary supplementation: Illusory invulnerability created by taking dietary supplements licenses health-risk behaviors. *Psychological Science*, 22, 1081–1086. doi:10.1177/0956797611416253
- Colcombe, S., & Kramer, A. (2003). Fitness effects on the cognitive function of older adults: A meta-analytic study. *Psychological Science*, 14, 125–130. doi:10.1111/1467-9280.t01-1-01430
- Conroy, D. E., Hyde, A. L., Doerksen, S. E., & Ribeiro, N. F. (2010). Implicit attitudes and explicit motivation prospectively predict physical activity. *Annals of Behavioral Medicine*, 39, 112–118. doi:10.1007/s12160-010-9161-0
- Csikszentmihalyi, M., & Graef, R. (1980). The experience of freedom in daily life. *American Journal of Community Psychology*, 8, 401–414. doi:10.1007/BF00912853
- Custers, R., & Aarts, H. (2010). The unconscious will: How the pursuit of goals operates outside of conscious awareness. *Science*, 329, 47–50. doi:10.1126/science.1188595
- Danner, U. N., Aarts, H., & de Vries, N. (2007). Habit formation and multiple means to goal attainment: Repeated retrieval of target means causes inhibited access to competitors. *Personality and Social Psychology Bulletin*, 33, 1367–1379.
- DeBono, A., Shmueli, D., & Muraven, M. (2011). Rude and inappropriate: The role of self-control in following social norms. *Personality and Social Psychology Bulletin*, 37, 136–146. doi:10.1177/0146167210391478
- Deci, E. L., Koestner, R., & Ryan, R. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, 125, 627–668. doi:10.1037/0033-2909.125.6.627
- Deci, E. L., & Ryan, R. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227–268. doi:10.1207/S15327965PLI1104\_01
- De Cocker, K. A., De Bourdeaudhuij, I. M., Brown, W. J., & Cardon, G. M. (2007). Effects of “10,000 steps Ghent”: A whole-community intervention. *American Journal of Preventive Medicine*, 33, 455–463.
- DeWall, C. N., Baumeister, R. F., & Masicampo, E. (2008). Evidence that logical reasoning depends on conscious processing. *Consciousness and Cognition*, 17, 628–645. doi:10.1016/j.concog.2007.12.004
- Dewey, J. (1922). *Human nature and conduct: An introduction to social psychology*. New York, NY: Holt.
- Dijksterhuis, A., Chartrand, T., & Aarts, H. (2007). Effects of priming and perception on social behavior and goal pursuit. In J. Bargh (Ed.), *Social Psychology and the unconscious: The automaticity of higher mental processes* (pp. 51–132). Philadelphia, PA: Psychological Press.
- Dishman, R. K., & Buckworth, J. (1997). Adherence to physical activity. In W. P. Morgan (Ed.), *Physical activity and mental health* (pp. 63–80). Washington, DC: Taylor & Francis.
- Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford, CA: Stanford University Press.
- Fiedler, K., Bluemke, M., & Unkelbach, C. (2009). Exerting control over allegedly automatic associative processes. In J. Forgas, R. Baumeister, & D. Tice (Eds.), *The psychology of self-regulation: Cognitive, affective,*

- and motivational processes (pp. 249–269). New York, NY: Psychological Press.
- Fishbach, A., & Dhar, R. (2005). Goals as excuses or guides: The liberating effect of perceived goal progress on choice. *Journal of Consumer Research*, 32, 370–378. doi:10.1086/497548
- Fishbach, A., Friedman, R., & Kruglanski, A. (2003). Leading us not unto temptation: Momentary allurements elicit overriding goal activation. *Journal of Personality and Social Psychology*, 84, 296–309. doi:10.1037/0022-3514.84.2.296
- French, D., Sutton, S., Hennings, S., Mitchell, J., Wareham, N., Griffin, S., . . . Kinmonth, A. (2005). The importance of affective beliefs and attitudes in the theory of planned behavior: Predicting intention to increase physical activity. *Journal of Applied Social Psychology*, 35, 1824–1848. doi:10.1111/j.1559-1816.2005.tb02197.x
- Gardner, B., & Lally, P. (2012). Does intrinsic motivation strengthen physical activity habit? Modeling relationships between self-determination, past behavior, and habit strength. *Journal of Behavioral Medicine*, 35. Epub ahead of print.
- Gibbons, J. (2010, January). *I can't get no . . . job satisfaction, that is (Report No. R-1459–09-RR)*. New York, NY: The Conference Board.
- Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist*, 54, 493–503. doi:10.1037/0003-066X.54.7.493
- Gollwitzer, P. M., Sheeran, P., Trötschel, R., & Webb, T. (2011). Self-regulation of priming effects on behavior. *Psychological Science*, 22, 901–907. doi:10.1177/0956797611411586
- González-Vallejo, C., Lassiter, G., Bellezza, F., & Lindberg, M. (2008). "Save angels perhaps": A critical examination of unconscious thought theory and the deliberation-without-attention effect. *Review of General Psychology*, 12, 282–296. doi:10.1037/a0013134
- Grant, A., & Schwartz, B. (2011). Too much of a good thing: The challenge and opportunity of the inverted U. *Perspectives on Psychological Science*, 6, 61–76. doi:10.1177/1745691610393523
- Haggard, P. (2008). Human volition: Towards a neuroscience of will. *Nature Reviews Neuroscience*, 9, 934–946. doi:10.1038/nrn2497
- Hertzog, C., Kramer, A., Wilson, R., & Lindenberger, U. (2009). Enrichment effects on adult cognitive development: Can the functional capacity of older adults be preserved and enhanced? *Psychological Science in the Public Interest*, 9, 1–65.
- Hochberg, L. R., Bacher, D., Jarosiewicz, B., Masse, N. Y., Simeral, J. D., Vogel, J., . . . Donoghue, J. P. (2012). Reach and grasp by people with tetraplegia using a neurally controlled robotic arm. *Nature*, 485, 372–375. doi:10.1038/nature11076
- Hofmann, W., Vohs, K. D., & Baumeister, R. F. (2012). What people desire, feel conflicted about, and try to resist in everyday life. *Psychological Science*, 23, 582–588. doi:10.1177/0956797612437426
- Houser-Marko, L., & Sheldon, K. (2006). Motivating behavioral persistence: The self-as-doer construct. *Personality and Social Psychology Bulletin*, 32, 1037–1049. doi:10.1177/0146167206287974
- Iso-Ahola, S. E. (1980). *The social psychology of leisure and recreation*. Dubuque, IA: Wm. C. Brown.
- Iso-Ahola, S. E. (1999). Motivational foundations of leisure. In E. Jackson & T. Burton (Eds.), *Leisure studies: Prospects for the twenty-first century* (pp. 35–51). State College, PA: Venture.
- Iso-Ahola, S. E. (2009). Exercise and freedom. *World Leisure Journal*, 51, 134–149. doi:10.1080/04419057.2009.9728266
- Iso-Ahola, S. E., Hamberger, M., Savage, K., Oviatt, D., Goldstein, J., & Ambach, K. (2006). Constraints to exercise: Attitudinal antecedents and motivational consequences. *World Leisure Journal*, 48, 22–32. doi:10.1080/04419057.2006.9674463
- Iso-Ahola, S. E., & Mannell, R. (2004). Leisure and health. In J. Haworth & A. Veal (Eds.), *Work and leisure* (pp. 184–199). London, UK: Routledge.
- Iso-Ahola, S. E., & Miller, M., (2012). *Nonconscious and conscious priming of a complex behavior: Exercise*. Submitted for publication.
- Iso-Ahola, S. E., & St. Clair, B. (2000). Toward a theory of exercise motivation. *Quest*, 52, 131–147. doi:10.1080/00336297.2000.10491706
- Johnson, C. A., Corrigan, S., Dubbert, P., & Grambling, S. (1990). Perceived barriers to exercise and weight control practices in community women. *Women & Health*, 16, 177–191. doi:10.1300/J013v16n03\_10
- Kahn, E. B., Ramsey, L., Brownson, R., Heath, G., Howze, E., Powell, K., . . . Corso, P. (2002). The effectiveness of interventions to increase physical activity. *American Journal of Preventive Medicine*, 22, 73–107. doi:10.1016/S0749-3797(02)00434-8
- Kahneman, D. (2011). *Thinking fast and slow*. New York, NY: Farrar, Straus, and Giroux.
- Keeler, E. B., Manning, W., Newhouse, J., Sloss, E., & Wasserman, J. (1989). The external costs of a sedentary life-style. *American Journal of Public Health*, 79, 975–981. doi:10.2105/AJPH.79.8.975
- Kendzierski, D., Furr, R., & Schiavoni, J. (1998). Physical activity self-definitions: Correlates and perceived criteria. *Journal of Sport & Exercise Psychology*, 20, 176–193.
- Kiviniemi, M. T., Voss-Humke, A., & Seifert, A. (2007). How do I feel about the behavior? The interplay of affective associations with behaviors and cognitive beliefs as influences on physical activity behavior. *Health Psychology*, 26, 152–158. doi:10.1037/0278-6133.26.2.152
- Knapp, D. (1988). Behavioral management techniques and exercise promotion. In R. Dishman (Ed.), *Exercise adherence* (pp. 203–235). Champaign, IL: Human Kinetics.
- Kohl, H. W., Craig, C. L., Lambert, E. V., Inoue, S., Alkandari, J. R., Leetongin, G., & Kahlmeier, S. (2012). The pandemic of physical inactivity: Global action for public health. *The Lancet*, 380, 294–305. doi:10.1016/S0140-6736(12)60898-8
- Langer, E. J., & Rodin, J. (1976). The effects of choice and enhanced personal responsibility for the aged: A field experiment in an institutional setting. *Journal of Personality and Social Psychology*, 34, 191–198. doi:10.1037/0022-3514.34.2.191
- Latimer, A. E., Rivers, S. E., Rench, T. A., Katulak, N. A., Hicks, A., Hodorowski, J. K., . . . Salovey, P. (2008). A field experiment testing the utility of regulatory fit messages for promoting physical activity. *Journal of Experimental Social Psychology*, 44, 826–832. doi:10.1016/j.jesp.2007.07.013
- Leander, N. P., Shah, J. Y., & Chartrand, T. L. (2009). Moments of weakness: The implicit context dependencies of temptations. *Personality and Social Psychology Bulletin*, 35, 853–866. doi:10.1177/0146167209334784
- Lee, I.-M., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N., & Katzmarzyk, P. T. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: An analysis of burden of disease and life expectancy. *The Lancet*, 380, 219–229. doi:10.1016/S0140-6736(12)61031-9
- Leotti, L. A., & Delgado, M. R. (2011). The inherent reward of choice. *Psychological Science*, 22, 1310–1318. doi:10.1177/0956797611417005
- Libet, B. (1985). Unconscious cerebral initiative and the role of conscious will in voluntary action. *Behavioral and Brain Sciences*, 8, 529–566. doi:10.1017/S0140525X00044903
- Libet, B., Gleason, C., Wright, E., & Pearl, D. (1983). Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential): The unconscious initiation of a freely voluntary act. *Brain*, 106, 623–642. doi:10.1093/brain/106.3.623
- Litt, M. D., Kleppinger, A., & Judge, J. O. (2002). Initiation and maintenance of exercise behavior in older women: Predictors from the social learning model. *Journal of Behavioral Medicine*, 25, 83–97. doi:10.1023/A:1013593819121
- Lombard, D. N., Lombard, T. N., & Winett, R. A. (1995). Walking to meet health guidelines: The effect of prompting frequency and prompt structure. *Health Psychology*, 14, 164–170. doi:10.1037/0278-6133.14.2.164

- Mannell, R., & Bradley, W. (1986). Does greater freedom always lead to greater leisure? Testing a person  $\times$  environment model of freedom and leisure. *Journal of Leisure Research*, 18, 215–230.
- Marcus, B., Eaton, C., Rossi, J., & Harlow, L. (1994). Self-efficacy, decision-making, and stages of change: An integrative model of physical exercise. *Journal of Applied Social Psychology*, 24, 489–508. doi:10.1111/j.1559-1816.1994.tb00595.x
- Miller, J., Shepherdson, P., & Treyena, D. (2011). Effects of clock monitoring on electroencephalographic activity: Is unconscious movement initiation an artifact of the clock? *Psychological Science*, 22, 103–109. doi:10.1177/0956797610391100
- Mittal, B. (1988). Achieving higher seat belt usage: The role of habit in bridging the attitude–behavior gap. *Journal of Applied Social Psychology*, 18, 993–1016. doi:10.1111/j.1559-1816.1988.tb01189.x
- Muraven, M., & Baumeister, R. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin*, 126, 247–259. doi:10.1037/0033-2909.126.2.247
- Muraven, M., Baumeister, R., & Tice, D. (1999). Longitudinal improvement of self-regulation through practice: Building self-control through repeated exercise. *The Journal of Social Psychology*, 139, 446–457. doi:10.1080/00224549909598404
- Myrseth, K., & Fishbach, A. (2009). Self-control, a function of knowing when and how to exercise restraint. *Current Directions in Psychological Science*, 18, 247–252. doi:10.1111/j.1467-8721.2009.01645.x
- Neal, D., Wood, W., Labrecque, D., & Lally, P. (2012). How do habits guide behavior? Perceived and actual triggers of habits in daily life. *Journal of Experimental Social Psychology*, 48, 492–498. doi:10.1016/j.jesp.2011.10.011
- Neal, D., Wood, W., & Quinn, J. (2006). Habits: A repeat performance. *Current Directions in Psychological Science*, 15, 198–202. doi:10.1111/j.1467-8721.2006.00435.x
- The Nielsen Company. (2010). What consumers watch: Americans spend more time with video than ever. Three Screen Report, 7. Retrieved from [http://blog.nielsen.com/nielsenwire/wp-content/uploads/2010/03/3Screens\\_4Q09\\_US\\_rpt.pdf](http://blog.nielsen.com/nielsenwire/wp-content/uploads/2010/03/3Screens_4Q09_US_rpt.pdf)
- Nisbett, R., & Wilson, T. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review*, 84, 231–259. doi:10.1037/0033-295X.84.3.231
- Papies, E., Aarts, H., & de Vries, N. (2009). Planning is for doing: Implementation intentions go beyond the mere creation of goal-directed associations. *Journal of Experimental Social Psychology*, 45, 1148–1151. doi:10.1016/j.jesp.2009.06.011
- Patall, E. H., Cooper, H., & Robinson, J. (2008). The effects of choice on intrinsic motivation and related outcomes: A meta-analysis of research findings. *Psychological Bulletin*, 134, 270–300. doi:10.1037/0033-2909.134.2.270
- Payne, J. W., Samper, A., Bettman, J., & Luce, M. (2008). Boundary conditions on unconscious thought in complex decision making. *Psychological Science*, 19, 1118–1123. doi:10.1111/j.1467-9280.2008.02212.x
- Pockett, S. (2006). The neuroscience of movement. In S. Pockett, W. Banks, & S. Gallagher (Eds.), *Does consciousness cause behavior?* (pp. 9–24). Cambridge, MA: MIT Press.
- Rhodes, R. E., & Plotnikoff, R. (2006). Understanding action control: Predicting physical activity intention–behavior profiles across 6 months in a Canadian sample. *Health Psychology*, 25, 292–299. doi:10.1037/0278-6133.25.3.292
- Roediger, H., Goode, M., & Zaromb, F. (2008). Free will and the control of action. In J. Bauer, J. Kaufman, & R. Baumeister (Eds.), *Are we free? Psychology and free will* (pp. 205–225). New York, NY: Oxford University Press.
- Rosenwald, M. (2006, January 22). Why America has to be fat. *Washington Post*, pp. F1, F8.
- Savani, K., Markus, H., Naidu, N., Kumar, S., & Berlia, N. (2010). What counts as a choice? U.S. Americans are more likely than Indians to construe actions as choices. *Psychological Science*, 21, 391–398. doi:10.1177/0956797609359908
- Savani, K., Stephens, N., & Markus, H. (2011). The unanticipated interpersonal and societal consequences of choice: Victim blaming and reduced support for the public good. *Psychological Science*, 22, 795–802. doi:10.1177/0956797611407928
- Schmeichel, B. J., & Vohs, K. (2009). Self-affirmation and self-control: Affirming core values counteracts ego depletion. *Journal of Personality and Social Psychology*, 96, 770–782. doi:10.1037/a0014635
- Schwartz, B. (2004). *Paradox of choice: Why more is less*. New York, NY: Ecco Press.
- Schwarzer, R. (2001). Social–cognitive factors in changing health-related behaviors. *Current Directions in Psychological Science*, 10, 47–51. doi:10.1111/1467-8721.00112
- Senay, I., Albarracin, D., & Noguchi, K. (2010). Motivating goal-directed behavior through introspective self-talk: The role of the interrogative form of simple future tense. *Psychological Science*, 21, 499–504. doi:10.1177/0956797610364751
- Shah, J. Y., Friedman, R., & Kruglanski, A. (2002). Forgetting all else: On the antecedents and consequences of goal shielding. *Journal of Personality and Social Psychology*, 83, 1261–1280. doi:10.1037/0022-3514.83.6.1261
- Sheeran, P., Webb, T., & Gollwitzer, P. (2005). The interplay between goal intentions and implementation intentions. *Personality and Social Psychology Bulletin*, 31, 87–98. doi:10.1177/0146167204271308
- Silva, M. N., Markland, D., Carraco, E. V., Vieira, P. N., Coutinho, S. R., Minderico, C. S., . . . Teixeira, B. J. (2011). Exercise autonomous motivation predicts 3-year weight loss in women. *Medicine and Science in Sports and Exercise*, 43, 728–737. doi:10.1249/MSS.0b013e3181f3818f
- Snihotta, F., Scholz, U., & Schwarzer, R. (2005). Bridging the intention–behavior gap: Planning, self-efficacy, and action control in the adoption and maintenance of physical exercise. *Psychology & Health*, 20, 143–160. doi:10.1080/08870440512331317670
- Soon, C. S., Brass, M., Heinze, H., & Haynes, J. (2008). Unconscious determinants of free decisions in the human brain. *Nature Neuroscience*, 11, 543–545. doi:10.1038/nn.2112
- Spayd, L. (1995, November 26). How time lies. *Washington Post*, pp. C1–C4.
- Standage, M., Sebire, S., & Loney, T. (2008). Does exercise motivation predict engagement in objectively assessed bouts of moderate-intensity exercise?: A self-determination theory perspective. *Journal of Sport & Exercise Psychology*, 30, 337–352.
- Tai-Seale, T. (2003). Stage of change specific triggers and barriers to moderate physical activity. *American Journal of Health Behavior*, 27, 219–227. doi:10.5993/AJHB.27.3.3
- Talbot, L. A., Fleg, J., & Metter, J. (2003). Secular trends in leisure-time physical activity in men and women across four decades. *Preventive Medicine*, 37, 52–60. doi:10.1016/S0091-7435(03)00058-6
- Thompson, C., & Wankel, L. (1980). The effects of perceived activity choice upon frequency of exercise behavior. *Journal of Applied Social Psychology*, 10, 436–443. doi:10.1111/j.1559-1816.1980.tb00722.x
- Tomasello, M., Carpenter, M., Call, J., Behne, T., & Moll, H. (2005). Understanding and sharing intentions: The origins of cultural cognition. *Behavioral and Brain Sciences*, 28, 675–691. doi:10.1017/S0140525X05000129
- Vallacher, R., & Wegner, D. (1987). What do people think they're doing? Action identification and human behavior. *Psychological Review*, 94, 3–15. doi:10.1037/0033-295X.94.1.3
- Vansteenkiste, M., Simons, J., Soenens, B., & Lens, W. (2004). How to become a persevering exerciser? Providing a clear, future intrinsic goal

- in an autonomy-supportive way. *Journal of Sport & Exercise Psychology*, 26, 232–249.
- Vara, L. S., & Epstein, L. (1993). Laboratory assessment of choice between exercise or sedentary behaviors. *Research Quarterly for Exercise and Sport*, 64, 356–360.
- Verplanken, B. (2006). Beyond frequency: Habit as a mental construct. *British Journal of Social Psychology*, 45, 639–656. doi:10.1348/014466605X49122
- Wankel, L., & Thompson, C. (1977). Motivating people to be physically active: Self-persuasion vs. balanced decision making. *Journal of Applied Social Psychology*, 7, 332–340. doi:10.1111/j.1559-1816.1977.tb00757.x
- Wegner, D. M. (1994). Ironic processes of mental control. *Psychological Review*, 101, 34–52. doi:10.1037/0033-295X.101.1.34
- Wegner, D. (2002). *The illusion of conscious will*. Cambridge, MA: MIT press.
- Wilson, T. (2002). *Strangers to ourselves: Discovering the adaptive unconscious*. Cambridge, MA: Harvard University Press.
- Winett, R. (1998). Developing more effective health-behavior programs: Analyzing the epidemiological and biological bases for activity and exercise programs. *Applied & Preventive Psychology*, 7, 209–224. doi:10.1016/S0962-1849(98)80025-5
- Wood, W., & Neal, D. (2007). A new look at habits and habit–goal interface. *Psychological Review*, 114, 843–863. doi:10.1037/0033-295X.114.4.843
- Wood, W., Quinn, J., & Kashy, D. (2002). Habits in everyday life: Thought, emotion, and action. *Journal of Personality and Social Psychology*, 83, 1281–1297. doi:10.1037/0022-3514.83.6.1281
- Wood, W., Tam, L., & Witt, M. (2005). Changing circumstances, disrupting habits. *Journal of Personality and Social Psychology*, 88, 918–933. doi:10.1037/0022-3514.88.6.918
- Yin, Z., & Boyd, M. (2000). Behavioral and cognitive correlates of exercise self-schemata. *Journal of Psychology: Interdisciplinary and Applied*, 134, 269–282. doi:10.1080/00223980009600867
- Zhong, C.-B., & DeVoe, S. (2010). You are how you eat: Fast food and impatience. *Psychological Science*, 21, 619–622. doi:10.1177/0956797610366090

Received January 3, 2012

Revision received September 29, 2012

Accepted September 30, 2012 ■