Interventions to Break and Create Consumer Habits

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Interventions to change everyday behaviors often attempt to change people's beliefs and intentions. As the authors explain, these interventions are unlikely to be an effective means to change behaviors that people have repeated into habits. Successful habit change interventions involve disrupting the environmental factors that automatically cue habit performance. The authors propose two potential habit change interventions. "Downstream plus" interventions provide informational input at points when habits are vulnerable to change, such as when people are undergoing naturally occurring changes in performance environments for many everyday actions (e.g., moving households, changing jobs). "Upstream" interventions occur before habit performance and disrupt old environmental cues and establish new ones. Policy interventions can be oriented not only to the changing of established habits but also to the acquisition and maintenance of new behaviors through the formation of new habits.

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What a person eats for dinner has little impact on his or her overall health, and whether a person drives to work on a particular morning contributes only minimally to traffic congestion and air pollution. However, these kinds of small actions and decisions that consumers make in daily life have an impact beyond any single occurrence.

As everyday behaviors are repeated, they exert significant, cumulative impact on medical, social, and economic outcomes experienced by both individual consumers and society as a whole. For example, it has been estimated that weight gain and obesity in the majority of the population could be addressed if people ate a few less bites at each meal or took approximately 2000 extra steps each day (Hill and Wyatt 2003). In addition, highway traffic congestion can emerge from a few drivers' nonessential trips. Even a single car that proceeds at varying speeds within a stream of traffic can send waves of congestion propagating down the line behind it (Nagatani 2000).

In this article, we explain the implications of consumers' repeated behavior for policy interventions focused on behavior change. In particular, we focus on two consumer issues, health policies designed to reduce obesity and transportation policies designed to ensure smart use of the automobile. Policy interventions to change behavior will be most successful when they are designed with consumers' habits in mind. As we explain, a variety of interventions are likely to be effective at changing nonhabitual behaviors, including informational campaigns and self-help strategies. However, actions that have been repeated in stable contexts are most likely to be changed through interventions that disrupt the environmental cues that trigger habit performance automatically. We ground these recommendations in a review of the psychological literature on habits.

Behavior Change Interventions

Policy interventions to promote a healthful diet, increase physical activity, and manage transportation often take the form of information campaigns. Information is provided to the public through public media campaigns, private sector advertising, some types of individual counseling, and educational programs. For example, the U.S. government's guidelines for daily food intake have been reworked into various pyramid shapes in recent years in an effort to convey effectively the sizes and numbers of daily servings for various foods. Information campaigns exhort people to eat five fruits and vegetables daily and to drink milk. With respect to transportation, daily ozone reports in major cities advise people when to stay indoors and limit nonessential driving. Local transportation authorities in towns and cities advertise their bus routes and train schedules to encourage public use.

Information campaigns that successfully convey information do not necessarily change consumers' behaviors. The disconnection between changing minds and changing behavior has been noted in several different literature streams. Derzon and Lipsey (2002) conducted a meta-analytic synthesis of 110 reports of the effectiveness of media interventions to curb substance abuse. For the duration of the campaigns, on average, viewers' levels of abuse

actually increased, even though their attitudes toward abuse became more negative. In addition, Albarracin and colleagues' (2005) synthesis of various health interventions to increase condom use found no significant increase in use from persuasive messages alone. Similarly, Lodish and colleagues' (1995) synthesis of more than 350 real-world experiments on the effects of television advertising revealed that increases in the amount of advertising did not yield any simple increase in product sales. Even commercials that were effective (as assessed by consumers' successful recall and reports of persuasion) did not strongly correspond to consumer purchases as reflected in sales impact.

Informational campaigns and self-help programs represent only one possible approach to behavior change. The various points at which interventions can be applied are illustrated in an anecdote that John McKinlay (1975, p. 7) shared more than 30 years ago at an American Heart Association conference. In this anecdote, a physician made the following lament:

> "You know," he said, "sometimes it feels like this. There I am standing by the shore of a swiftly flowing river, and I hear the cry of a drowning man. So I jump into the river, put my arms around him, pull him to shore and apply artificial respiration. Just when he begins to breathe, there is another cry for help. So I jump into the river, reach him, pull him to shore, apply artificial respiration, and then just as he begins to breathe, another cry for help. So back in the river again, reaching, pulling, applying, breathing and then another yell. Again and again, without end, goes the sequence. You know, I am so busy jumping in, pulling them to shore, applying artificial respiration, that I have no time to see who the hell is upstream pushing them all in."

Informational campaigns and self-help programs offer a kind of "downstream," individual-level intervention designed to change the behavior of people who already suffer from a given risk factor (e.g., sedentary lifestyle, unhealthful diet). These interventions attempt to solve health and traffic congestion problems through the decision making of individual consumers.

In this article, we explain that consumers' everyday lifestyle habits limit the effectiveness of downstream interventions that do not address the performance contexts and social structural factors that maintain habits. Habits are a form of automaticity in responding that develops as people repeat actions in stable circumstances (Pascoe and Wood, in press; Verplanken 2006; Verplanken and Aarts 1999). When initially performing an action, people typically decide what to do and how to do it to achieve certain outcomes and avoid others. As people repeat actions, their decision making recedes, and the actions come to be cued by the environment. Specifically, habit formation involves the creation of associations in memory between actions and stable features of the circumstances in which they are performed. Recurring aspects of performance circumstances come to trigger habitual responses directly without input from people's intentions or decisions to act (Ji Song and Wood 2006; Ouellette and Wood 1998; Verplanken et al. 1998). Habits might be triggered by prior responses in a chain of responses; by environmental cues, such as time of day or location; by internal states, such as particular moods; and by the presence of typical interaction partners (Ji Song and

Wood 2006; Ouellette and Wood 1998; Wood, Tam, and Guerrero Witt 2005).

As we explain, because habits are linked to recurring performance environments, they are not easily changed with only downstream, informational interventions. However, the dependence of habits on environmental cues represents an important point of vulnerability. Disrupting the environmental cues that trigger and maintain habit performance renders habits open to change (Wood, Tam, and Guerrero Witt 2005). Thus, for interventions targeted at changing consumers' habits, downstream approaches will be most successful when they are paired with environmental changes that disrupt existing habits. Specifically, informational campaigns to change habits gain power when they are applied during naturally occurring periods of change in consumers' lives (e.g., moving to a new location, changing jobs). We call these "downstream-plus-context-change" interventions to indicate that not only do they provide new information, but they do so when consumers are undergoing natural shifts in the performance environment.

As an alternative to focusing downstream, McKinlay (1975, 1993) proposes "upstream" policy and environmental interventions that do not treat problems after they occur but rather are designed to prevent undesired outcomes and maintain optimal lifestyles (see also Butterfield 1990; Jeffery 1989; Milio 1976; Orleans 2000; Smith, Orleans, and Jenkins 2004). Upstream interventions target social norms and contextual supports for desired actions and include programs such as establishing standard portion sizes for packaged foods, improving the availability and efficiency of bus networks, and providing opportunities for telecommuting from home instead of driving to an office. To the extent that interventions aimed upstream of a behavior alter critical features of the performance environment, they are likely to be successful at disrupting unwanted habits. Furthermore, new performance environments can provide a stable context to foster the creation of more desirable habits and the maintenance of those habits over the long run. Thus, whereas downstream interventions aim to alleviate existing negative outcomes, upstream interventions aim to prevent such outcomes in the first place.

Habits Resist Informational Interventions

To explain why downstream-plus-context-change and upstream interventions effectively change habits, we first consider why habits are resistant to downstream, informational interventions. In part, this resistance arises because habit formation is associated with the development of *expectations* about behavior and the performance environment. Repetition-based expectations reduce sensitivity to minor variations in the performance setting, curtail information search (especially search for information that challenges practiced ways of responding), and reduce thought and deliberation about the action.

The expectations that develop with habit formation can serve as a filter that renders people insensitive to minor changes in performance contexts. With such expectations, for example, consumers who are in the habit of eating a pint of ice cream for dessert may fail to notice when the product manufacturers add a label to the carton that indicates that a

pint is four servings. In a similar manner, consumers with stronger driving habits use public transportation less often to commute to work, even when the highway they use routinely for commuting is closed (Fujii, Gärling, and Kitamura 2001). In an experimental demonstration of the insensitivity that arises with automatic responding, Fazio, Ledbetter, and Towles-Schwen (2000) exposed participants repeatedly to photographs of faces to create well-practiced reactions (i.e., accessible attitudes) toward them. Participants were subsequently shown some of the faces again but in a slightly changed, "morphed" form. Participants who had seen the faces repeatedly in the first part of the study had greater difficulty detecting the changes and apparently relied on their expectations formed during the prior exposures. These findings suggest that people with strong habits hold expectations about the environment that reduce their capacity to detect when it changes. In holding such expectations, consumers may overlook new information that arises about the practiced action and its alternatives. They may fail to avail themselves of new and better alternatives simply because their expectations reduce awareness of such information.

Expectations established with response repetition also limit how much information consumers consider before they act. To investigate information search, Verplanken, Aarts, and Van Knippenberg (1997) asked a group of European car owners to choose a travel mode for each of 27 hypothetical travel situations. Each travel choice involved various features (e.g., distance, weather conditions) that participants could learn about by explicitly selecting information. Some participants had strong habits to drive a car, and others had weak habits. An important result was that car drivers with stronger habits selected significantly less information. They required less information about the travel situations to make decisions to drive. Furthermore, the reduced information search characterized not only automobile habits but also habits for other transportation options. Thus, participants with strong habits to ride a bike also were found to search less for information about alternative travel options before making travel choices.

Another feature of habit-based expectations is a confirmatory information search strategy. As habits develop, people form expectancies for certain outcomes and are especially receptive to these outcomes when they occur in the future. As evidence of this confirmatory bias, Betsch and colleagues (2001) report that when a decision context was framed as being similar to previous ones, participants with strong habits searched information that supported the habitual choice and avoided information that might challenge it. Similarly, Verplanken, Aarts, and Van Knippenberg (1997) find that participants with strong habits acquired proportionally the most information about the habitual travel mode option itself compared with information about alternative travel mode options, whereas this tendency was less evident for those with weaker habits. Thus, in addition to limiting the amount of information people seek out, strong habits are associated with a search for information that is congenial and supports continued habit performance.

Finally, the expectations established with strong habits appear to decrease the complexity of consumers' decision making about action. Demonstrating this shallow processing, Aarts, Verplanken, and Van Knippenberg (1997) pre-

sented participants with a large number of travel mode situations that varied on four dimensions (e.g., distance) and asked them to indicate for each situation whether they would ride a bike. Participants with a strong bike habit used simpler (i.e., noncompensatory) decision rules than did those with a weak bike habit. In addition, Betsch, Fiedler, and Brinkmann (1998) find that time pressure increased the likelihood of following established routines and using simpler decision strategies. Thus, research also suggests that a habitual mind-set is characterized by shallow, abbreviated decision making about action.

In summary, consumers with strong habits develop expectations for certain environmental and behavioral events. These expectations lead to a kind of tunnel vision that is evident in the following: People with strong habits expect prior experiences to repeat, and as a result, they do not easily detect minor changes in the performance environment. They also search less extensively for information about behavioral alternatives and for information about the performance context itself. In addition, their search tends to be biased toward confirming the habitual option. Finally, strong habits are associated with simple, shallow decision rules. Essentially, people with strong habits possess motivational and informational biases that reduce the likelihood that they will receive and evaluate favorably new, counter-habitual information. These biases reduce the impact of informational campaigns and help maintain existing behavior patterns.

Environmental Control Perpetuates Habits

The expectations we have described are likely to dampen the effects of new information, but they do not render people impervious to it. As we noted in the beginning of this article, media campaigns and product advertisements often are effective in changing consumers' attitudes and judgments. This change is evident in the shifts in public opinion about health and transportation over time as new information has become available about diet, exercise, and transportation options. For example, downstream interventions to exercise and eat a healthful diet have convinced many people that they would benefit from a healthier lifestyle. However, these kinds of interventions have yielded disappointing results with respect to long-term behavior change. In a review of weight-loss interventions, Jeffery and colleagues (2000, p. 8) note the "substantial weight regain that usually follows successful weight loss with behavioral treatments." Why are people's attempts to change unwanted health habits not more effective?

One explanation for this failure to change behavior is that many aspects of unwanted lifestyle habits are immediately gratifying. That is, habits are maintained by incentives (e.g., the convenience of taking the car), biological factors (e.g., addiction to nicotine in cigarettes, metabolism in obesity), or the psychological needs they serve (e.g., self-esteem boost from shopping; Verplanken et al. 2005). Notwithstanding these supports for unwanted habits, even minor changes in health habits can yield significant, positive outcomes that plausibly encourage performance of new, healthful behaviors. For example, in the case of weight control, many obese people report gratifying physical and social

benefits of losing even a small amount of weight (e.g., improved sexual quality of life, Binks et al. 2005). Despite such positive outcomes, healthful behavior is rarely maintained at the end of self-help intervention programs (see Jeffrey et al. 2000). To understand why habits persist despite people's best efforts to carry out intervention recommendations, it is useful to consider what is meant by environmental control.

Essentially, the environmental control of action reflects people's learning of associations between their actions and their performance circumstances. These associations can develop from deliberate reasoning, for example, when people learn a new skill (see ball → swing bat). Associations also can develop through implicit detection of covariation and, as such, reflect the contiguous activation of constructs in daily life (couch → eating snack foods). With repeated experience, responses and the contexts in which they occur become bound together in memory into chunks of information (Wood, Neal, and Quinn 2006). Whole sequences of habitual responses can then be activated by the environment and implemented as a unit.

Environmental control also may have a motivational substrate. The motivation behind environmental cuing appears to develop largely through the activation of the neural transmitter dopamine. A function of dopamine is to signal the receipt of rewarding events. Organisms are oriented to anticipate rewards. Thus, with the repeated receipt of rewards in a given context, the dopamine activation that initially occurred to the reward is transferred to the contextual cues that predict the reward (Wood, Neal, and Quinn 2006). In this way, contexts themselves can motivate repeated responding. In short, habit learning is a cognitive and motivational process in which the control of action is outsourced to the environment so that sequences of prior actions are triggered automatically by the appropriate circumstances.

Habit automaticity is evident in *minimal awareness*, in the sense that people do not need to attend closely to what they are doing when they habitually repeat prior behavior. *Efficiency* is evident in that habitually practiced actions are performed quickly, easily, with little effort, and in parallel with other behaviors. *Lack of conscious intention* is evident when habits are triggered by circumstances seemingly without people's desire or wish to perform them. Finally, some habits are characterized by *lack of control*, meaning that it is difficult to avoid initiating the behavior or performing it in the same way as in the past (e.g., Betsch et al. 2004; Heckhausen and Beckmann 1990; Verplanken 2006; Verplanken and Orbell 2003). In short, the environment's automatic activation of well-practiced responses is a key to the persistence of habits despite people's best intentions.

Habits Versus Conscious Intentions

The automaticity of habit performance perpetuates habits over alternative actions. There are several reasons for this (see Wood, Neal, and Quinn 2006). First, given that habits are cued relatively directly by the environment with minimal decision making, the practiced response is likely to be more immediately available than thoughtfully generated alternatives. When multiple response options are available, the speed of automatically activated responses gives them

precedence over responses generated through slower routes. Second, habits require minimal regulatory control. Habit performance places few demands on people's limited capacities for self-control (see Baumeister, Muraven, and Tice 2000), whereas greater capacity is required to suppress habits to carry out alternative behaviors that require conscious guidance and deliberation. For these various reasons, habits assume precedence over more thoughtful actions. The availability and efficiency of habits is a frustrating challenge to New Year's resolutions and other decisions to change established behavior.

The greater potency of habits than dispositions that require decision making has been illustrated in behavior prediction research. A standard prediction study begins with the assessment of participants' intentions to perform some action (e.g., eat five fruits and vegetables every day) and might also assess the strength of any existing habits (e.g., number of servings eaten in the past). Then, sometime later, participants are contacted again to determine whether they performed the action. As Triandis (1977, p. 205) suggests, "when a behavior is new, untried, and unlearned, the behavioral-intention component will be solely responsible for the behavior." However, "as behavior repeatedly takes place, habit increases and becomes a better predictor of behavior than behavioral intentions" (p. 205). Thus, Triandis suggests a trade-off between intention and habit in guiding behavior. This pattern has been documented in research on health habits and transportation use.

Illustrating the potency of health habits, Ji Song and Wood (2006) assessed the determinants of college students' purchase of fast food. Students reported on the strength of their habits to purchase fast food and whether they intended to purchase it in the next week. Each evening during the next week, they indicated in a diary whether and how often they had purchased fast food that day. Habit strength and the favorability of intentions were used to predict the number of times students purchased fast food during the week. As Figure 1 (Panel A) shows, when habits were weak or had not been formed, students acted on their intentions, and those who intended to purchase did so more often (simple slopes were estimated in line with the work of Cohen et al. [2003]). However, when habits were strong, intentions had little effect on behavior. The relatively flat slope is consistent with the idea that behavior continued to be cued by the performance context regardless of intentions.[1] Illustrating the potency of transportation habits, Verplanken and colleagues (1998) assessed the travel mode choices of residents of a small Dutch village. Participants kept a diary for one week in which they recorded their choice of travel mode for all trips outside the village. The village was connected to two nearby towns by both a highway and efficient public transport systems (i.e., bus and train). Frequency of car use, which was calculated as the proportion of trips made by car during the week, was predicted from the strength of participants' car use habits and their reported intentions to use the car. The pattern of findings followed that which we reported for fast-food purchases (see Figure 1, Panel B); namely, for residents with weak or moderate habits, more favorable intentions generated greater use of the car, whereas for those with strong habits, intentions were essentially unrelated to car use.

Although the behavior prediction findings suggest that habitual actions are cued without consulting conscious intentions, participants in these studies were likely aware of their purchases or automobile use. They may even have made decisions about aspects of their responses, such as counting the change for their purchases or finding their car keys. However, the performance context provided a sufficiently strong cue so that they performed daily activities (e.g., eating meals, going to the store) with specific, well-practiced action sequences that were performed without guidance from relevant intentions. Thus, regardless of their intentions, students with fast-food habits and town residents with driving habits repeated their prior actions.

The behavior prediction findings indicating that habits are performed regardless of intentions have important implications for behavior change. Namely, downstream, informational interventions that successfully change intentions do not necessarily influence behavior. Webb and Sheeran's (2006) recent meta-analytic review provides striking evidence in support of this idea. They reviewed previous experiments that had given people persuasive messages or other information designed to change their intentions to perform various behaviors. If the interventions addressed actions that were not easily repeated into habits, interventions that changed intentions also changed behavior. For example, when people were given information that convinced them of the benefits of getting a flu shot or that explained how to do so (e.g., where to go), they changed their intentions and carried them out by getting vaccinated. However, if the interventions addressed behaviors that could be repeated sufficiently to form habits, interventions that changed intentions did not necessarily change behavior. For example, interventions that successfully persuaded people they should eat a healthier diet, and therefore changed their eating intentions, were not effective at changing their actual eating behavior. Thus, habits were not easily altered through informational interventions that altered people's intentions.

Even when downstream interventions successfully alter habits, the effects appear to be largely short lived. For example, participants in Garvill, Marell, and Nordlund's (2003) field experiment kept travel diaries for three weeks. During the second week, the diaries for some participants were structured to make them especially aware of their travel behavior. Although participants with strong existing car-use habits reacted to the structured diaries by decreasing their car use during the next week of the study, such effects appear to be short lived. Verplanken, Aarts, and Van Knippenberg's (1997, Study 3) research that used a conceptually similar task to render participants aware of their travel behavior found that it only temporarily influenced participants with strong car use habits. Participants quickly reverted back to their original response patterns. We suspect that interventions designed to sensitize people to their habitual response patterns, similar to other informational interventions, have only limited effectiveness in changing habits to align them with people's intentions about how they want to act.

In summary, the expectations established through behavior repetition and the automaticity of habit performance are conservative forces that reduce openness to new information and that perpetuate well-practiced behaviors despite

people's intentions to do otherwise. These aspects of habit performance significantly hinder the effectiveness of downstream, individually focused interventions, such as informational campaigns and self-help strategies. Interventions that provide people with information about the right thing to do or that increase their understanding about how to perform a behavior are likely to be effective primarily with actions that are not practiced habitually. When the target behavior is habitual, people's intentions, desires, and judgments do not easily overcome the practiced response that is cued automatically by the environment.

Although the dependence of habits on stable aspects of the environment presents a barrier to information use, this feature of habits also represents a unique source of vulnerability; namely, habits can be changed through changes in those circumstances. As we explain in the remainder of the article, environmental control is a key to the success of interventions that are designed to change everyday habits and maintain new behavior.

Environmental Control of Habits

Because habits are triggered by the environment, successful interventions must focus on changing the environmental features that maintain those habits. A focus on environmental change is consistent with anecdotal reports that changing well-practiced behavior (e.g., quitting smoking) is often easiest while people are traveling or otherwise removed from everyday circumstances. Evidence of this phenomenon emerged in Heatherton and Nichols's (1994) investigation of people's attempts to change some aspect of their lives. Approximately 36% of people's reports of their successful change attempts involved moving to a new location, whereas only 13% of reports of unsuccessful attempts involved moving. In addition, 13% of successful change reports involved alterations in the immediate performance environment, whereas none of the unsuccessful reports involved shifts in environmental cues. The change in context presumably disrupted the automatic cuing of action, freed it from environmental control, and thus facilitated change efforts.

Empirical evidence for the power of environment change comes from Wood, Tam, and Guerrero Witt's (2005) study of college students transferring to a new university. Transfer students are of special interest because the move between schools can disrupt the circumstances that support everyday habits. One month before the transfer and one month after, students reported their intentions to exercise (plus several additional actions), their typical exercise frequency, and their typical exercise locations. The focus of the study was when exercising at the new university would be guided by intentions and when it would follow students' habits (if any) at the old university. Some of the students had established strong exercise-related habits at their old school, for example, regularly jogging on a trail outside or working out in the gym. For these students, old exercise habits maintained across the transfer when the performance location was stable from the old to the new university. When locations shifted and students could not, for example, work out in the gym, their exercise habits were disrupted. Notably, when locations shifted, students' behaviors came under inten-

tional control and were predicted by the favorability of the students' intentions. Students who wanted to exercise at the new university did so, whereas those who did not want to exercise quit. Presumably, without the old contextual cues to trigger automatically the well-practiced behavior, students were spurred to make decisions about exercising.

Given the evidence that changes in performance contexts can disrupt habits, it seems plausible that an effective intervention to change habits is to teach consumers how to change their typical performance contexts. This idea that habits can be changed through individual control of triggering stimuli is a central component of some behavior modification therapies (see Follett and Hayes 2001). However, the use of these strategies can require substantial ability and motivation. Consumers first need to identify the cues that trigger unwanted habits, and then they must understand how to avoid or control their exposure to the cues. Given that cues to overeating and inactivity are pervasive in our society, control of related actions will be challenging and will require vigilant monitoring of the environment (Quinn and Wood 2006). To the extent that control over these actions places a continuing demand on ability and motivational resources, stimulus control will be subject to the same problems of relapse and remission as other downstream intervention programs that depend on people's desire to change (Baumeister, Muraven, and Tice 2000; Neal, Wood, and Quinn, in press). For these reasons, relying on people's capacity to control the contexts of habit performance may not be a promising intervention strategy for policy makers who are interested in changing consumer habits.

Next, we outline what we believe are effective habit change interventions. Essentially, these require shifts in the performance environment that, unlike stimulus control strategies, do not arise from individual control efforts.

Effective Habit Change Interventions

The first question to ask when designing behavior change interventions is whether the target behavior is habitual. Has the population of interest repeated the behavior regularly in stable contexts (e.g., at particular times of day, in stable locations)? If the answer is yes, the target behavior is likely to be habitual. The diet and exercise behaviors that contribute to obesity are classic examples of habitual responses. In addition, automobile use, especially in the United States, is the habitual form of transportation for many people.

The second design question involves distinguishing between downstream and upstream behavior change interventions. As we noted at the beginning of this article, downstream interventions include education, counseling that might involve stimulus control and other behavior modification strategies, informational campaigns that identify costs of existing behaviors and benefits of new responses, and self-help programs that increase self-efficacy to perform new behaviors. These interventions are typically targeted directly to individual consumers to change problematic or unwanted behaviors. In contrast, upstream interventions are not aimed directly at individual behaviors but focus on the larger structural conditions in which people's behaviors are embedded. Thus, upstream interventions may consist of economic incentives, legislation, or structural changes in the

performance environment. These interventions aim to provide contexts and societal structures that promote and sustain desired behavior.

In Table 1, we integrate the distinction between strong and weak habits with that of upstream and downstream interventions to yield four possible intervention approaches. Each of these describes a particular type of intervention that is likely to be effective for a particular type of behavior.

Downstream Interventions

The upper-left quadrant of Table 1 represents the application of downstream intervention strategies with behaviors that are not strong habits. In this quadrant, there are many downstream strategies that have proved effective in changing nonhabitual behaviors (e.g., Perry et al. 1996, 2002; Webb and Sheeran 2006) and in generating short-term change in ongoing behaviors (e.g., Orleans 2000). A variety of potential intervention strategies are available for these kinds of behaviors and outcomes.

The strategies in the upper-left quadrant of Table 1 can be applied effectively to behaviors that could evolve into habits over time, such as unhealthful eating or overuse of automobiles. The interventions could be implemented among consumers who have not, or have not yet, developed strong habits. An illustration of this approach is the use of standard weight-loss interventions that involve education and implementation of self-control strategies with young dieters. These downstream approaches seem more effective in generating sustained weight loss with preadolescents than with adults (e.g., Jeffery et al. 2000). Among the many possible reasons for this effect is the possibility that obese children have fewer strongly established eating and exercise habits than obese adults.

Among the many available sources of downstream interventions, schools provide important health promotion information to adolescents. For example, an exploratory study among alternative-high-school teenagers suggested that such small-scale environments were promising grounds to deliver interventions to promote healthful food choices and to increase efficacy through healthful cooking classes (Kubrik, Lytle, and Fulkerson 2005).

Downstream interventions sometimes aim to provide people with tools for self-regulation as part of being educated into new behavioral domains. For example, young drivers must learn that speed control not only prevents getting tickets but also holds the key for better driving, such as being better prepared for handling unexpected situations, freeing up mental capacity, and avoiding accidents. Young dieters may learn how to monitor their weight properly, use information provided on food labels, and manage bodily sensations (e.g., by eating fruit to avoid feeling hungry).

Downstream-Plus-Context-Change Interventions

The lower-left quadrant of Table 1 involves effective downstream interventions that address unwanted behaviors with a strong habitual component, including unhealthful eating, alcohol use, or overreliance on the automobile. As we explained, the information-processing mind-sets that accompany strong habits and the automatic cuing of habits by the environment hinder the effectiveness of typical

downstream interventions that involve solely informational campaigns or self-regulation. However, greater success is likely when such downstream strategies are paired with naturally occurring lifestyle changes.

Downstream-plus-context-change interventions gain their effectiveness because the changes in context render people with strong habits vulnerable to new information. Specifically, environmental changes that disrupt habits also challenge habitual mind-sets and thus increase openness to new information and experiences. Furthermore, because these environmental changes impair the automatic cuing of well-practiced responses, they enable performance of new actions.

Changes in performance environments refer to aspects of the physical environment (e.g., new houses and travel infrastructures, introduction of healthful food items in restaurants) and the social environment (e.g., new friends who have adopted a healthful lifestyle or who use public transportation). Given shifts in these environmental features, various related habits might be disrupted, including transportation habits (e.g., commuting), consumption habits (e.g., water use), social interaction habits (e.g., relating to neighbors), and ecology-related habits (e.g., heating, electricity use, waste disposal/recycling; see Rodriguez 2005). The disruption of existing habits provides opportunities for successful downstream interventions that promote desired new behaviors without competition from established behavior patterns.

Downstream-plus-context-change interventions can be implemented at many of the significant life changes that people experience naturally across their life course. Targets for such interventions include residents who relocate to new homes and employees who move jobs or experience mergers in their work organizations. Such changes occur with some regularity across the life span. On average, Americans move every five years (Jasper 2000). At least during some points of their life, they change jobs with even greater frequency. According to a longitudinal survey of job changes, people born from 1957 to 1964 held an average of 10.2 jobs from ages 18 to 38 (Bureau of Labor Statistics 2004). Aging across the developmental stages of the life span also yields relevant lifestyle changes. Changes in performance environments often coincide with people's movement into another life phase, such as adolescents leaving their parents' home, couples starting a family, and older people entering retirement. Downstream-plus-context-change interventions are especially efficient options when environmental changes apply to groups of people, for example, when new residential areas are built or organizations merge.

The downstream-plus-context-change approach is exemplified in new resident marketing programs. Through "welcome wagons" and other such programs, new residents are contacted soon after they move and are provided information about local products, services, and vendors. Although these programs currently are oriented toward addressing the typical purchases of new homeowners, they could be adapted to provide information about healthful lifestyle options (e.g., parks and recreation facilities, public transportation options) and incentives to adopt healthful behaviors. Incentives might include social benefits, such as meet-

ing others and receiving recognition for participating, and tangible bonuses, such as free trial periods or use of facilities.

The downstream-plus-context-change approach is already being used by several U.S. metropolitan bus systems, which provide new city residents with a free bus pass (see, e.g., Centre Area Transportation Authority's apartment pass program; http://www.catabus.com/spaptpass.htm). Providing bus passes should be an especially effective strategy to increase ridership when people are new to an area and have yet to establish car-driving and other travel mode habits that might conflict with taking the bus. Downstream-plus-context-change interventions might successfully increase people's efficacy to perform the new behavior (e.g., learning bus routes or where to catch the bus) and the favorability of their intentions to do so. Research is still at an early stage in evaluating the success of such downstream-plus-context-change interventions, though there is good reason to believe that they will be more successful at altering everyday lifestyle habits than downstream interventions alone (e.g., simply providing a free bus pass; see Fujii and Kitamura 2003).

In summary, although downstream interventions by themselves are unlikely to change habitual behaviors, such interventions can be used strategically at points when naturally occurring changes in the performance environment render people especially vulnerable to change. Downstream-plus-context-change interventions should be most successful when the naturally occurring changes in the environment alter the specific cues that triggered established habits. As Wood, Tam, and Guerrero Witt (2005) observe, habits are disrupted by changes in the specific environmental cues that trigger habit performance. Given that people can report on changes in the performance environment for a particular action, these reports can be used to indicate when downstream interventions are likely to be effective. In short, when a target sample reports that some lifestyle change has disrupted critical aspects of a performance environment, the change provides a promising context for instigating a downstream-plus-context-change intervention.

Upstream Interventions

Upstream interventions that involve large-scale, macrolevel policy changes are especially suited to address the societal and environmental structures that promote and sustain habits. We list the various upstream types of interventions in the right column of Table 1. Examples that are especially relevant to obesity and transportation include (1) taxes and other economic incentives for healthful behaviors and the smart use of automobiles, (2) policy-driven changes that alter the physical environment or the behavioral alternatives within that environment, and (3) education that promotes the use of healthful and energy-efficient products (see McKinlay 1975; Orleans 2000). Policy makers who embark on upstream intervention strategies may use these various strategies depending on their particular goals.

Economic incentives are upstream policy interventions that encourage desired behavior through the provision of tax relief, cash incentives, or other subsidies for desired services (e.g., medical, transportation). Economic measures also

might discourage undesired behaviors through the imposition of taxes (e.g., so-called sin taxes). With respect to transportation, an example of a highly effective economic intervention for traffic congestion is the practice of congestion pricing, in which motorists are charged more to drive in a certain area or use a tunnel or bridge during peak periods. For example, in 2003, London implemented a policy in which drivers of private automobiles are charged a fee to drive in the central area during weekdays. According to Litman (2006), this policy has significantly reduced traffic congestion in the area, increased use of bus and taxi services, and generated substantial government revenues. With respect to health behaviors, economic incentives for preventive measures appear to be effective in the short run, especially for vaccinations and other simple behaviors with distinct, well-defined goals (Kane et al. 2004). However, economic incentives appear less effective when they provide rewards for specific outcomes of more complex behaviors, such as weight loss. Other scholars have argued that to induce and sustain long-term lifestyle changes, economic incentives are best coordinated with other system-level measures, such as educational experiences that support the changes (Breslow 1996).

Another way upstream interventions change the environment is by modifying it directly. For example, city planning and environmental design have the potential to yield specific transportation and health benefits. Smart city planning that is coordinated with road design and efficient transportation systems will be required to reduce consumers' reliance on the automobile. In addition, city planning that promotes human-powered transportation, such as biking and walking, has the potential to reduce obesity. In support, residents from communities with higher density, greater connectivity, and more mixed land use report higher rates of walking and cycling for utilitarian purposes (Saelens, Sallis, and Frank 2003). In addition, technological developments may be important elements of upstream interventions. For example, easily applicable monitoring devices (e.g., to measure heart rate, blood pressure, and blood sugar) may help people sustain healthful lifestyles.

Policy regulations also directly change the performance environment when they change available behavioral alternatives. Sometimes this can be accomplished by increasing the ease of performing certain behaviors. For example, recycling can be significantly increased when the environment is structured to promote such behavior through optimal collection periods and methods (Schultz, Oskamp, and Mainieri 1995). Other times, changes in behavioral alternatives can be accomplished through limiting possible responses. For example, school boards across the United States are adopting policies to ban or restrict access to junk food in school cafeterias and vending machines located on school property. Although currently there is little data indicating whether such bans indeed increase the healthfulness of students' diets and reduce obesity, the bans hold considerable promise to do so (Fox et al. 2005). A better-known example of upstream interventions that limit behavioral alternatives is policies that prohibit smoking in workplaces and public areas, such as restaurants and public buildings. The effectiveness of such bans is attested by a 1992 internal document from cigarette maker Phillip Morris, which summa-

rized the results of smoking bans in workplaces. "Total prohibition of smoking in the workplace strongly affects industry volume. Smokers facing these restrictions consume 11 per cent to 15 per cent less than average and quit at a rate that is 84 per cent higher than average" (as reported in Doward 2005). However, a recent analysis of the effects of smoking bans undertaken in Australia indicates that not everyone is influenced by them equally (Buddelmeyer and Wilkins 2005). Among younger smokers, the introduction of bans had the undesired effect of increasing the likelihood that they continued to smoke. Such patterns suggest the usefulness of our proposed downstream-plus-context-change interventions. Informational campaigns that addressed the concerns of young smokers regarding the smoking ban might have promoted quitting among this sample.

Finally, educating consumers is a form of upstream intervention that does not involve immediate context change but has the potential to change performance contexts over time. Educational efforts can take many forms, including courses or modules integrated into existing curricula at schools or universities, self-education opportunities, or long-standing public campaigns. The availability of the World Wide Web makes this an increasingly important source of education. Educational interventions that change consumers' beliefs and understanding of their behaviors are most likely to have immediate impact on those who have not established habits (e.g., educational programs about condom use aimed at young teenagers). However, educational programs may have long-term effects that bring about change in performance environments, such as when education conveys new norms and values that infuse the decisions of policy makers. In recognition of these long-term effects, we include education as an upstream intervention in the upper-right quadrant of Table 1. However, because education typically has minimal immediate impact on performance contexts, it has only long-term promise as a habit change strategy.

In general, our review of research on effective habit change strategies for complex behaviors, such as those that yield obesity and overreliance on the automobile, suggests that any single intervention strategy is unlikely to be sufficient to yield change across a population. Instead, our review suggests the effectiveness of broad-spectrum interventions that address multiple levels of analysis, such as our downstream-plus-context-change strategy (see also Orleans 2000). Sometimes prescriptions that involve multiple strategies have considered stages of behavior change, in which interventions are tailored to individual phases of change (e.g., the transtheoretical model; Prochaska, DiClemente, and Norcross 1992). Although such models are not built on an understanding of the psychological mechanisms that control repeated action in daily life, they propose a range of possible interventions that might be useful for people as they move from initially contemplating to undertaking behavior change.

Swimming Upstream

The combined use of downstream and upstream initiatives often begins with interventions focused at the downstream level, when unwanted behaviors initially become a target for intervention. As downstream attempts to change behaviors

develop, policy makers may expand these into broader, long-term upstream interventions. An example of this progression from downstream to upstream intervention strategies can be found in a remarkable project called Jamie's School Dinners by one of Britain's popular chefs, Jamie Oliver. Several schools were persuaded to abandon the processed, ready-made junk food they were serving to students and staff and to replace it with fresh, nutritious food prepared from scratch every day (e.g., Oliver 2005). Although students initially resisted the changes from their fatty junk food habits, they eventually were persuaded by peer pressure, the school environment, and parental support. During this process, it became apparent that the success of this project was conditional on structural changes within the schools themselves as well as at the level of community and national politics (e.g., extra pay for cafeteria workers, additional training and equipment). Eventually, the British prime minister addressed the issue of healthier school meals, and an independent food trust was formed to expand the work that Oliver began (Hinsliff and Hill 2005).

In summary, downstream-plus-context-change interventions seize naturally occurring opportunities to disrupt existing habits and to provide new information and opportunities to create new habits. In addition, upstream interventions can orchestrate the necessary environmental changes to reduce competition from established responses and to encourage the performance of new, more desirable responses. Essentially, to alter old habits and establish new ones, the critical ingredients for any interventions include (1) changes in the old performance environment that disrupt existing habits coupled with (2) opportunities or experiences that encourage performance of the desired response. In the next section, we consider exactly how to construct interventions to encourage performance of new responses and to ensure their maintenance.

Creating Habits as an Intervention Goal

The effectiveness of interventions depends not only on the change of existing habits and the initiation of a new behavior but also on the maintenance of that behavior. One mechanism to ensure that new responses continue is through the creation of new habits. Despite the large amount of research and practice involving interventions to change behavior, the idea that interventions can ensure maintenance by creating habits has received little attention. This omission is partly due to the history and definition of habit. Historically, researchers often equated habit with frequency of behavior and thus viewed strong habits simply as frequent performance. When habits are defined as we do in this article—that is, in terms of the automatic cuing of behavior by stable performance circumstances—habit formation can be targeted as an intervention goal, and changes in habit strength can be monitored over time.

How should habits be created? As we explained previously, the basic mechanisms of habit formation involve repetition and reinforcement of behavior (see Hull 1943). At least initially, reinforcement is important to promote repetition. Adopting and repeating a new action depends largely on people's judgments that the outcome it affords is more desirable than those offered by alternative actions (e.g.,

Rothman 2000). Imagine a successful intervention aimed at convincing commuters to switch from car to train travel. It is easy to predict what will happen if these new train passengers experience schedule delays or crowded trains. This lesson is well learned among marketers, given that product sales constitute a solid behavioral criterion that is monitored over time.

There are various reinforcements that can promote performance of a new behavior. Some people may find that living up to important health or environmental values is sufficiently reinforcing to motivate repeated performance. For others, these abstract values are not especially motivating, and more potent reinforcements are the behavioral outcomes of efficiency, profitability, and convenience (see Verplanken and Holland 2002). For example, tangible incentives to change travel behaviors include providing free bus tickets and passes, both of which have proved effective at increasing frequency of bus ridership among college students, a group likely to be still learning about transportation options (Bamberg, Ajzen, and Schmidt 2003; Fujii and Kitamura 2003). In general, the various downstream interventions listed in the middle column of Table 1 can be used to emphasize the desirability of a target action over other possible responses.

As people repeat actions, habits may develop naturally as environment–response associations are gradually laid down in procedural memory (Wood, Neal, and Quinn 2006). In addition, such associations may be formed deliberately through "implementation intentions," or plans of action that specify exactly the behaviors that are to be performed in response to specific cues (i.e., how, when, and where to act; Gollwitzer and Schaal 1998). People might form implementation intentions and plan to go to the gym on their way home from work every day this week or to take the bus on Monday morning. When people form these plans to perform an action in response to environmental cues, they are beginning to establish a habit.

Implementation intentions are surprisingly effective given the simple nature of such plans (Orbell 2004; Sheeran 2002). Although it is tempting to argue that the mechanism by which implementation intentions works mimics the mechanism of habits, the cue–response links associated with implementation intentions have a different history than those of habits. With implementation intentions, these links are established by deliberate planning, whereas with habits, they are established by a history of satisfactorily repeating behavior. Furthermore, implementation intentions increase performance only to the extent that people view the behavior as relevant to achieving desired goals (Sheeran, Webb, and Gollwitzer 2005). In contrast, habits continue to be performed regardless of people's intentions (see Figure 1, Panels A and B). As such, implementation intentions represent a promising starting point for establishing habits (Holland, Aarts, and Langendam 2006; Verplanken 2005). With repetition, the very same cue–response associations that are initially executed in a deliberate fashion as part of planning may turn into habitual cue–response associations that function automatically.

To demonstrate that implementation intentions facilitate habit formation, Orbell and Verplanken (2006) asked participants to form a behavioral intention to floss their teeth

regularly. Some participants furnished this intention with implementation intentions and outlined when and where they would floss every day during the following four weeks. When the study began, few participants had a flossing habit (e.g., 66% reported never flossing before). Participants were then given a floss packet. Four weeks later, the packets were weighed, and participants reported on their behavior. As expected, those who formed implementation intentions flossed more frequently than those who did not, and on the basis of their descriptions of performance, they were more likely to form habits to floss automatically, given stable contexts. These results give some support to the contention that forming implementation intentions facilitates the establishment of future habits.

Despite their effectiveness in encouraging the repetition of new actions, implementation intentions, as with most downstream strategies, are less useful for countering existing habits. Illustrating the limits of implementation intentions, Webb, Sheeran, and Luszczynska (2006) investigated whether implementation intentions could help high school smokers quit. Some smokers in the study were asked to formulate specific plans of action in response to difficult situations for a smoker (e.g., "When someone offers me a cigarette of my favorite brand, in order not to smoke I will.…"). Habit strength was assessed according to the number of cigarettes smoked daily. One month later, participants were asked how many cigarettes they smoked per day. The implementation intentions reduced the numbers of cigarettes smoked per day only among participants with initially weak smoking habits. Thus, implementation intentions were not able to reduce strong smoking habits (see also Verplanken and Faes's [1999] study of eating habits). It seems that implementation intentions are useful to link performance to environmental cues and thus facilitate habit formation, but they do not appear sufficiently powerful to override well-practiced actions automatically cued by contexts. This might be because overriding strong habits taxes self-control resources, which appear to be limited in capacity and easily depleted (Baumeister, Muraven, and Tice 2000).

Despite the promise of establishing new habits through rewards for the new action and through links forged with environmental features (e.g., from implementation intentions), we are not aware of any health or transportation interventions to date that have adopted habit development as an explicit goal. Such interventions would involve a multipronged approach that promotes change of existing behavior patterns through the adoption of a new behavior and the formation of associations between actions and environmental cues to ensure the maintenance of the behavior over time (see Rothman, Baldwin, and Hertel 2004).

Summary and Conclusions

Understanding habits is important to public policy in domains concerned with everyday action, including healthful living, product purchase, media use, transportation, and environmental quality. We argue that change interventions are most likely to be successful when they are tailored to the habit strength of the target behavior.

Everyday actions that are not habitual are open to change through downstream interventions, such as informational

campaigns and self-help programs that are designed to educate people and motivate them to change. According to the diary studies, in which college student and community samples reported on what they were doing, thinking, and feeling once per hour for several days, approximately 45% of respondents' everyday actions were habits in the sense that they were performed almost daily and usually in the same location (Wood and Quinn 2005; Wood, Quinn, and Kashy 2002). Thus, a full 55% of reported actions were not habits. Even regularly performed behaviors are not always performed habitually. For example, driving is likely to be a habit when going to work, but it is likely to involve decision making when it represents a pleasure trip on the weekend or when newly licensed drivers are still learning driving skills. In this way, many everyday actions are amenable to change through downstream interventions and to shift when people learn new information or skills relevant to performance.

Habits perpetuate prior behaviors and limit the effectiveness of downstream interventions. Consumers with habits have strong expectations for the environment and action alternatives that shield behavior from change through new information. Even when consumers become convinced of the advisability of habit change, they are likely to continue to perform a behavior that is automatically cued by stable features of the environment. However, the dependence of habits on environmental cues renders them vulnerable to intervention strategies that involve changes in those cues. Sometimes environmental changes occur naturally, as when people move to new homes, when organizations merge, or when a town's road and transportation infrastructure is redesigned. When old cues to everyday activities change, habits are disrupted, and people potentially are spurred to think about their actions and perhaps to use their intentions as a guide to new choices. Thus, an opportunity for successful informational campaigns to change habitual behavior is provided through pairing downstream interventions with naturally occurring changes in living environments. We termed these downstream-plus-context-change interventions to emphasize their focus on immediate problem solving and kicking old habits by strategically taking advantage of naturally occurring shifts in lifestyles. An example of a downstream-plus-context-change intervention to address transportation is the provision of bus passes to new residents in some metropolitan areas in the United States.

Habits also are amenable to policy interventions that occur considerably upstream of a target behavior and that involve strategically designed changes in the performance context itself. These types of interventions focus on prevention of undesired behaviors. As we explained, examples of upstream interventions that address obesity and transportation include taxes and other economic incentives for healthful behaviors and strategic use of automobiles; policies that change the physical and social environment to reduce access to food, encourage exercise, and encourage use of alternative forms of transportation; and education to yield long-term changes in context and social structure.

Finally, we proposed that successful interventions need to target not only change of old, unwanted behaviors but also the maintenance of new, more desirable responses. When habit formation is realized as an intervention goal, new behaviors are maintained, and relapse is prevented. Inter-

ventions that specifically tie an action to a context by employing implementation intention planning ensure repetition of an action and thus represent a useful component of large-scale intervention programs.

In these various ways, the realization that behavior can acquire habitual qualities has significant consequences for the design of policy interventions. Effective interventions are built most importantly on an analysis of the extent to which consumers' existing behaviors are habits. Is the action targeted for change one that the target population tends to repeat regularly in stable contexts? If the answer is yes—and we guess that it is yes for many of the everyday actions associated with health and consumers' use of transportation—this feature of action should guide the design of change interventions. Successful interventions to change old and establish new habits must (1) change the context cues that trigger existing habits, (2) establish incentives and intentions that encourage new actions, and (3) promote repetition of new actions in stable circumstances so that associations form in memory between features of the environment and the response. Through interventions designed with these goals in mind, old habits can be disrupted, and new habits can be established.

In the reality of everyday life, accidents, immediate problems, and mishaps usually attract the attention of the media and policy makers, such as areas of serious traffic congestion or alarming health statistics. The primary responses to these events are likely to be downstream interventions aimed at solving these immediate problems. However, on the basis of psychological research on habits, we offer a rationale that addresses the structural factors that generate such problems, including the lack of accessible and efficient public transportation, the presence of an unhealthful diet culture, and sedentary lifestyles. These underlying conditions are more difficult to identify and change. However, upstream interventions hold the promise of accomplishing this. Such approaches often present significant challenges to design and implement, given that they take time, often require political support, and can be expensive. We believe that such investments are necessary if society is to promote ecologically responsible and healthful behaviors. Successful change strategies address not only immediate problems through downstream interventions but also the upstream factors that encourage and maintain the repetition of everyday behavior.

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[1]The behavior prediction findings we report in Figure 1 (i.e., intentions do not predict performance for people with strong habits) are not simply a measurement artifact, such as restriction of range. In additional analyses, Ji Song and Wood (2006) and Verplanken and colleagues (1998) report that no consistent association emerged between habit strength and variability of measures. Thus, the failure for intentions to predict behavior for people with strong habits cannot be attributed to uniformly favorable intentions or uniformly high-frequency performance.

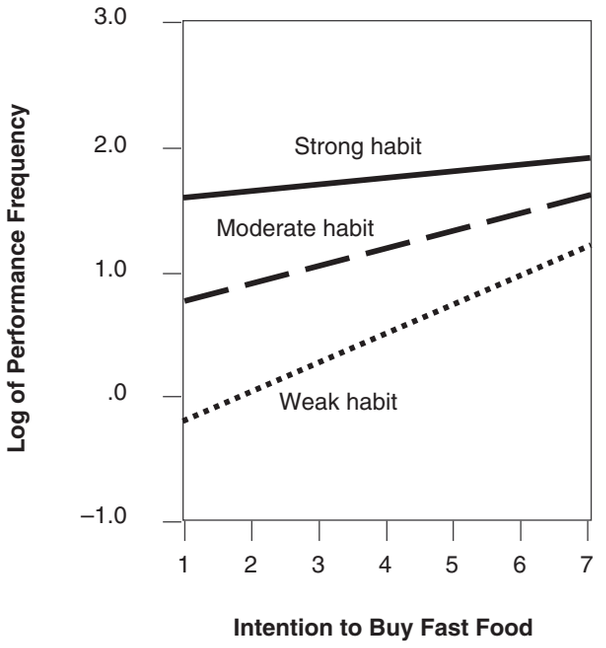
Table 1: Effective Policy Interventions to Change Weak Versus Strong Habits

Behavior to Be Changed	Interventions Downstream of the Behavior	Interventions Upstream of the Behavior
Weakly or not habitual	**Information/education to** •increase self-efficacy •change beliefs/intentions •motivate self-control •form implementation intentions	**Education** Economic incentives Legislation and regulation Environmental design Technology development Normative approaches
Strongly habitual	Downstream-plus-context-change	**Economic incentives** Legislation and regulation Environmental design Technology development Normative approaches

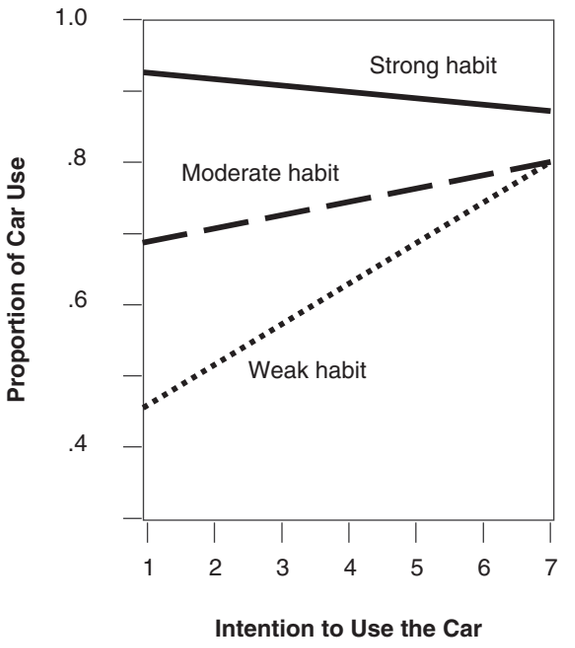
Notes: Our distinction between interventions that are down- versus upstream of the to-be-changed behavior is based on McKinlay (1975).

Figure 1. The Prediction of Behavior by Intentions Broken Down by Habit Strength

A: The Results of Poisson Regression Predicting College Students' Frequency of Purchasing Fast Food



B: The Results of Poisson Regression Predicting Consumers' Car Use During a Week



Notes: The results of Panel A are from Ji Song and Wood (2006). The figure is a simple slope decomposition of the interaction between favorability of intentions to purchase and strength of prior purchasing habits ($p < .01$; N = 117). The results of Panel B are from Verplanken and colleagues (1998). Specifically, the figure is a simple slope decomposition of the interaction between favorability of intentions to use the car and strength of prior car use habits ($p < .01$; N = 200).