



**STUDYDADDY**

**Get Homework Help  
From Expert Tutor**

**Get Help**

**Hal G. Rainey, Editor**

**Ivo Vlaev**

University of Warwick, United Kingdom

**Dominic King**

Imperial College London, United Kingdom

**Paul Dolan**

London School of Economics, United Kingdom

**Ara Darzi**

Imperial College London, United Kingdom

## Theory to Practice

# The Theory and Practice of “Nudging”: Changing Health Behaviors

**Ivo Vlaev** is professor of behavioral science at the University of Warwick, United Kingdom. He holds a doctorate in experimental psychology from the University of Oxford. His research advances understanding of human decision making (behavioral economics) and behavior change. It is a convergence of psychology, neuroscience, and economics that achieves results that none of the disciplines could achieve by themselves. Ivo is also coauthor of the U.K. Cabinet Office Mindspace report advising policy makers how to effectively use behavioral insights.

**E-mail:** ivo.vlaev@wbs.ac.uk

**Dominic King** is clinical lecturer in surgery at Imperial College London, United Kingdom. He combines work as a general surgeon with research interests in behavioral economics and behavioral design. As part of his PhD in behavioral economics, he codeveloped the Mindspace framework that provides policy makers with a user-friendly guide for applying the latest behavioral insights. He has published research in journals including *British Medical Journal*, *Health Affairs*, and *The Lancet*.

**E-mail:** dominic.king@imperial.ac.uk

**Paul Dolan** is professor of behavioral science at the London School of Economics, United Kingdom, and director of the Executive MS in Behavioral Science program. Previous posts include a research scholarship at Princeton University. His research interests lie in understanding and changing human behavior and happiness. He is author of the best-selling book *Happiness by Design: Finding Pleasure and Purpose in Everyday Life*.

**E-mail:** p.h.dolan@lse.ac.uk

**Ara Darzi** holds the Paul Hamlyn Chair of Surgery and is director of the Institute of Global Health Innovation at Imperial College London, United Kingdom. Research led by Professor Darzi is directed toward achieving best surgical practice through innovation in surgery and enhancing patient safety and the quality of health care. He has published more than 800 peer-reviewed research papers to date and in 2013 was elected as a fellow of the Royal Society. He previously served from 2007 to 2009 as a health minister in the U.K. government.

**E-mail:** a.darzi@imperial.ac.uk

**Abstract:** *Many of the most significant challenges in health care—such as smoking, overeating, and poor adherence to evidence-based guidelines—will only be resolved if we can influence behavior. The traditional policy tools used when thinking about influencing behavior include legislation, regulation, and information provision. Recently, policy analysts have shown interest in policies that “nudge” people in particular directions, drawing on advances in understanding that behavior is strongly influenced in largely automatic ways by the context within which it is placed. This article considers the theoretical basis for why nudges might work and reviews the evidence in health behavior change. The evidence is structured according to the Mindspace framework for behavior change. The conclusion is that insights from behavioral economics offer powerful policy tools for influencing behavior in health care. This article provides public administration practitioners with an accessible summary of this literature, putting these insights into practical use.*

## Practitioner Points

- Policy makers need to better recognize that we are being influenced and influencing others all the time.
- New approaches to health policy incorporating the latest insights from the behavioral sciences offer a potentially powerful set of tools to influence decision making.
- Mindspace is a widely used framework for policy that can support policy makers in developing more effective interventions.
- There is a growing body of evidence supporting the application of behavioral insights in health policy that is increasingly being drawn from large field studies.
- Policy makers need to recognize that “nudge”-type interventions are controversial and may provoke public and political concern.

A significant part of the years of healthy life now lost worldwide is attributable to “lifestyle” factors such as smoking, alcohol misuse, and poor diet, with roughly one-half of all deaths in the United States attributable to personal behaviors (Lozano et al. 2012; Mokdad et al. 2004; WHO 2009). Health losses as a consequence of lifestyle are particularly prevalent among the least well-off in society (Mackenbach et al. 2008), and significant gains in population health may be achieved by relatively small changes in the choices people make.

Human decision making also contributes to substantial provider-side challenges faced by health systems in improving clinical outcomes and controlling health care expenditures. Many patient encounters fail to follow evidence-based recommendations (Grol 2001; Grol and Grimshaw 2003), and overutilization of expensive health care resources is a problem across many health systems (Emanuel and Fuchs 2008). Behavioral insights can

help explain why such problems are so pervasive and difficult to counter (Darzi et al. 2011).

Traditionally, behavior change policies and interventions in health care have tended to focus on providing new *information*, seeking to change the way people think about their behavior, or providing different (financial or legal) *incentives* that change the consequences of behavior (Cecchini et al. 2010). Many existing interventions targeted at health-related behaviors rely on influencing the way people consciously think about their behavior. These interventions draw on the assumption that people change behavior accordingly when motivations and intentions are changed (see Shumaker et al. 2008).

The problem is that a substantial proportion of the variance in behavior is not explained by intentions. Several meta-analyses imply that changing intentions would account for less than one-third of the variance in behavior change, and estimates based on

experimental or causal studies report explained variance as low as 3 percent (Sheeran 2002; Webb and Sheeran 2006).

In contrast to economic models of rational choice suggesting that we respond to information and price signals, insights from across the behavioral sciences suggest that human behavior is actually led by our very human, emotional, and fallible brain and influenced greatly by the context or environment within which many of our decisions are taken (Kahneman 2011; Thaler and Sunstein 2008). In other words, behavior is not so much thought about; it simply comes about. The human brain uses a number of heuristics to simplify decision making, but these “rules of thumb” can also lead people into predictable systematic biases and errors (Kahneman 2003; Kahneman and Tversky 2000).

A more comprehensive understanding of human decision making provides us with opportunities to influence choices that take better account of how people actually respond to the context within which their decisions are made—the so-called choice architecture (Thaler and Sunstein 2008). The same errors that trip people up can also be used to help them make better choices (Loewenstein, Brennan, and Volpp 2007).

Policies that change the context or “nudge” people in particular directions have captured the imagination of policy makers at the same time that the limitations of traditional approaches have become apparent (see Hofmann, Friese, and Wiers 2008; Shafir 2012).<sup>1</sup> Popularized in Richard Thaler and Cass Sunstein’s book *Nudge* (2008), the theory underpinning many of the policy suggestions is built on decades of research in the behavioral sciences, and particularly the growing field of “behavioral economics,” by academics such as Robert Cialdini, Amos Tversky, and Nobel laureate Daniel Kahneman (Cialdini 2007; Kahneman 2003; Kahneman and Tversky 2000). As the subtitle of the *Nudge* book goes—“Improving decisions about health, wealth, and happiness”—behavioral economics is the “descriptive” science of human decision making (i.e., the study of how humans actually make decisions). Behavioral economics, which combines insights from economics and psychology, provides new ways to think about the barriers to and drivers of a range of behaviors, including health insurance take-up and coverage and tendency to contribute to retirement savings (Baicker, Congdon, and Mullainathan 2012; Madrian and Shea 2001). The attractiveness of using insights from behavioral economics has been partly attributable to the perceived potential to offer “low-cost, unobtrusive” solutions to societal challenges in an era of fiscal austerity (Loewenstein et al. 2012; Shafir 2012).

The literature on nudging, however, has not been specific about the definition of nudging and how it differs from other public health tools. Thaler and Sunstein’s definition of a “nudge” as “any aspect of the choice architecture that alters people’s behavior in a predictable way without forbidding any options or significantly changing their economic incentives” (2008, 6) does not provide a precise operational definition of the applied meaning of those terms. The term “choice architecture” is defined as the environments

within which people make choices (Marteau et al. 2011; Thaler and Sunstein 2008). Hollands et al. (2013) systematically review the evidence base for nudge (choice architecture) interventions and propose the following, more precise, operational definition of such interventions: “interventions that involve altering the properties or placement of objects or stimuli within micro-environments with the intention of changing health-related behaviour. Such interventions are implemented within the same micro-environment as that in which the target behaviour is performed, typically require minimal conscious engagement, can in principle influence the behaviour of many people simultaneously, and are not targeted or tailored to specific individuals.”

This definition specifically reflects the focus in nudge theory on automatic processes—hence minimal conscious engagement is required—but does not exclude conscious and reflective processes. This definition also includes physical and social dimensions of micro-environments, that is, the focus is on the specific context, namely, interventions that involve altering small-scale physical and social environments (e.g., spaces such as restaurants, workplaces, homes, and shops). In contrast to nudge interventions, conventional public health tools usually include dissemination of information, warning labels, menus with calorie counts listed, and alterations to the physical environment (e.g., more nearby parks and sidewalks to help fight obesity). An essential feature of these “reflective” strategies is their appeal to reflective mental processes in order to provoke informed choice. Crucially, such tools are not usually designed to fulfill the operational definition of choice architecture interventions (of course, some conventional interventions such as warning labels, for example, might unintentionally prompt automatic nudge-like effects on behavior).

Not everyone shares the current enthusiasm for integrating nudges into public policy, with commentators citing a lack of evidence to support a shift to their use (Horton 2011; Marteau et al. 2011). Such perspectives are in part a consequence of the lack of a robust framework to use when thinking about interventions

---

Different disciplines will have different theories and perspectives on how best to model behavior and its contextual determinants, and, as with most issues, disciplinary and multi-disciplinary research is required.

---

designed to influence behavior in nudge-like ways. Different disciplines will have different theories and perspectives on how best to model behavior and its contextual determinants, and, as with most issues, disciplinary and multidisciplinary research is required. But more than that, and perhaps even more so in the design of choice architectures, a practical framework is required to enable practitioners to apply the insights from the behavioral sciences.

At the request of the U.K. Cabinet Office (the department of the U.K. government responsible for supporting the prime minister and the cabinet), a group of behavioral and social scientists was tasked with developing a framework that could be used practically by policy makers and also act as a focus for further exploration of the evidence base and appropriateness of using nudge-type interventions. The framework developed was Mindspace (Dolan et al. 2010), which served as the initial operating framework for work of the Behavioral Insights Team (Behavioral Insights Team 2011; U.K. Cabinet Office 2011), the world’s first government

institution dedicated to the application of behavioral science to better policy making. Established in 2010, the Behavioral Insights Team was tasked by the prime minister with delivering “innovative ways of encouraging, enabling and supporting people to make better choices for themselves.” Subsequently spun out from government, the Behavioral Insights Team is now a social purpose company with more than 70 staff members and international offices in Australia and New York (Behavioral Insights Team 2015).

MindSpace is a summary categorization of a body of largely automatic and contextual effects on behavior that have been found in experimental settings in the laboratory and in the field. This framework has already been exposed to conventional academic scrutiny (Dolan et al. 2012). This article seeks to stimulate discussion about the evidence base and the appropriateness of behavior change interventions using MindSpace in the health domain. The importance of behavior change in health care is substantial both in terms of morbidity and mortality in terms of cost (Darzi et al. 2011). Once again, the U.K. government has been at the forefront of taking a behavioral approach, with the U.K. Department of Health stating that it will explore “nudging people in the right direction rather than banning or significantly restricting their choices” and that “there is significant scope to use approaches that harness the latest techniques of behavioral science” to enable people to make healthier choices (U.K. Department of Health 2010).

Although MindSpace has already been applied to various behavioral issues and domains in public policy (see Dolan et al. 2012), by selectively sampling evidence in health behavior change and summarizing it in terms of the MindSpace framework, our purpose is twofold: practical and theoretical. The practical aim is to reveal how recent insights from behavioral economics, such as the nudge approach, could provide a powerful set of new and refined policy tools to use when trying to influence behaviors in health. This objective is achieved by providing convincing examples of nudge effects on behavior change in health, which are systematized in a framework (MindSpace) that provides a useful “checklist” for policy makers and practitioners. The theoretical aim is to demonstrate how those seemingly very diverse types of nudge effects can be explained in terms of a small set of underlying theoretical mechanisms for action, which are derived from recent advances in behavioral economics. Therefore, even though there will be more nudge phenomena to be discovered and added to the MindSpace list, the proposed underlying mechanisms and their explanatory power may continue to guide future theorizing and intervention design. Before achieving the practical aim—exploring each of the elements of MindSpace—we first achieve the theoretical aim by setting out in the next section a conceptual model that serves to ground MindSpace in behavioral science.

## Understanding Behavior

This article offers a theory explaining how nudges cause behavior change before providing convincing examples of nudging health behavior change.

### Mechanisms of Action

The “dual process” model has been proposed as a theoretical basis for understanding health behaviors (Hofmann, Friese, and Wiers

2008; Marteau, Hollands, and Fletcher 2012; Marteau et al. 2011; Sheeran, Gollwitzer, and Bargh 2013). In particular, psychologists and neuroscientists have recently converged on a description of brain functioning that is based on two types of cognitive processes, interpreted as two distinct systems (or sets of systems): evolutionarily older “System 1” processes, which are described as automatic, uncontrolled, effortless, associative, fast, unconscious, and affective, and more recent, characteristically human “System 2” processes, which are described as reflective, controlled, effortful, rule based, slow, conscious, and rational (see Chaiken and Trope 1999; Evans 2008; Strack and Deutsch 2004). Neurobiological evidence of separate brain structures for automatic processing of information provides substantial support for this model (Anderson et al. 2004). Note, however, that even though the idea that automatic decisions play a role in health behavior is not new (e.g., see Hofmann, Friese, and Wiers 2008; Sheeran, Gollwitzer, and Bargh 2013), such accounts predominantly argue that impulsive/automatic decisions should be controlled and modified (“rewired”) by training and intervention.

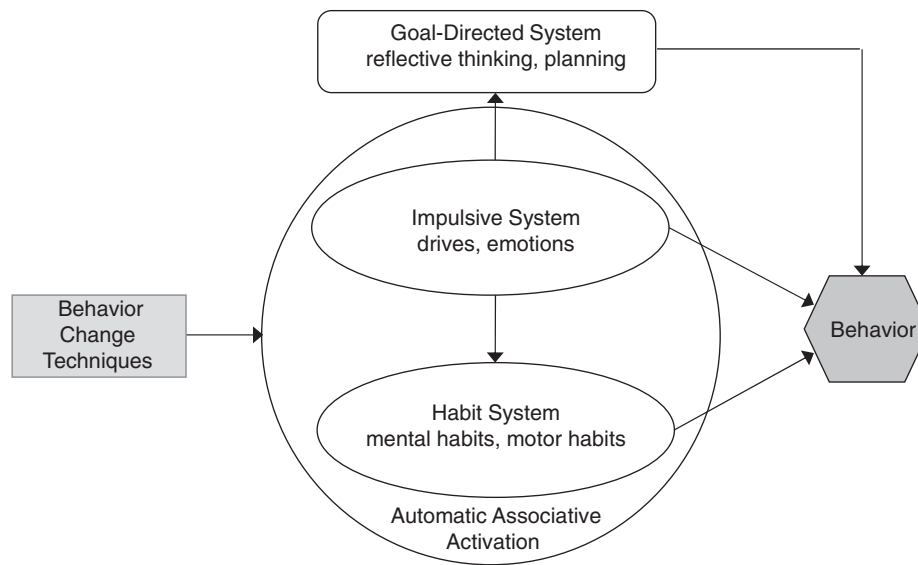
Although the dual process model is also proposed as a theoretical basis for nudge theory, the nudge approach uniquely proposes that automatic decisions can be systematically triggered to improve health outcomes (Marteau, Hollands, and Fletcher 2012; Marteau et al. 2011). In other words, nudge theory goes with the grain of human nature instead of trying to change it.

Similarly, our proposed theoretical framework employs the dual process paradigm as a unified framework for behavior change, but, in addition, we provide a more nuanced account of how the automatic systems control behavior and how impulsive decisions are influenced by nudges. This new account is based on very recent developments within behavioral economics and cognitive neuroscience (see Glimcher et al. 2009). This evidence converges on the view that multiple decision-making systems in the brain compute such choice/action values, which leads to a plethora of effects on behavior reported in the literature (see Rolls 2014).

Research has shown that there are three core brain systems for behavioral decision making, which generate specific psychological processes (thoughts, drives and emotions, and mental and motor habits) that independently cause behavior change (for a description of those brain structures and review of the evidence, see Vlaev and Dolan 2015). Figure 1 presents the self-regulatory processes involved in behavioral change. The idea that the brain contains multiple, separate decision systems is ubiquitous in cognitive and behavioral neuroscience (Balleine 2005; Church et al. 2009; Rangel, Camerer, and Montague 2008). In particular, reflective thought is embodied in the *goal-directed system*, which engages in model-based reasoning to calculate action-outcome contingencies and predict the sequences of actions required to achieve valuable outcomes.

Researchers have also distinguished two separate systems for automatic behavioral control. The *habit system* is responsible for adaptive stimulus-action associations. The habit system is centered on learning through repeated practice in a stable environment to assign values to a variety of actions proportionally to the rewards and punishments received as a result of executing those actions (Verplanken et al. 2007; Wood and Neal 2007). Later, the





**Figure 1** Self-Regulatory Processes Involved in Behavioral Change. *The three core brain systems for behavioral control can generate psychological processes (thoughts, drives, emotions, and mental and motor habits) and can independently influence behavior.*

environment alone is enough to cue the habitual response. The assumption that habit systems generate *motor habits* as well as *mental habits* (such as heuristics) is well supported in the literature (Bargh and Chartrand 1999; Gigerenzer and Goldstein 1996; Gigerenzer, Hoffrage, and Goldstein 2008; Orbell and Verplanken 2010). The *impulsive system* associates evolutionarily acquired affective states (e.g., belonging, attraction, comfort, disgust, fear, nurture, status, self-worth, trusting) to specific stimuli (e.g., food, money, social groups) (Curtis, Danquah, and Aunger 2009; Fiske 2010; Rolls 2014; Tybur and Griskevicius 2013).<sup>2</sup> As a result, those stimuli trigger innate automatic behaviors broadly described as “approach” and “avoidance.” The impulsive system can influence (enhance or suppress) the actions computed in the goal-directed and habit systems.

### Behavior Change Techniques

Designing effective behavior change interventions should start with understanding the behaviors in question and the drivers of and barriers to the desired and/or maladaptive behaviors (Abraham and Michie 2008; Fishbein et al. 2001; Michie, van Stralen, and West 2011; Shumaker et al. 2008). Only after knowing that a particular behavior is driven by specific type of goal, impulse, or habit (see figure 1) can we determine what *behavior change techniques* (BCTs) are most effective in the specific circumstances (see table 1).

As an example, a recent meta-analysis of interventions aiming to promote hygiene behavior in 11 developing countries allowed the interventions to be assigned to the three categories of underlying behavior (Curtis, Danquah, and Aunger 2009). These results were used to develop messages, which are a class of BCTs, aimed at increasing hand washing in restrooms in the developed world. The most effective messages turned out to be based on automatic motivational mechanisms; for example, the most effective messages used social norms to cue the belonging impulse (“Is the person next to you washing with soap?”), which increased hand washing by around 12 percent relative to the control condition.

There has been a recent initiative within health psychology that has attempted to develop a comprehensive taxonomy of BCTs used in interventions (Abraham and Michie 2008; Michie et al. 2013). This is important because we can develop a common language describing the “active ingredients” of complex interventions, which, in turn, can facilitate theory development (see Michie, van Stralen, and West 2011). Those taxonomies of BCTs, derived from systematic reviews of the available evidence, differentially engage the behavioral control systems (regulatory processes). Vlaev and Dolan (2015) describe how traditional BCTs (e.g., Abraham and Michie

**Table 1** The Mindspace Framework for Behavior Change. *The specific brain systems and psychological processes that they generate can explain the Mindspace elements and the examples discussed in the article (note that other nudges and examples may be better explained by different combinations of these underlying causes).*

Mindspace Technique	Behavior	Brain System	Psychological Process
Messenger	We are heavily influenced by who communicates information to us.	Impulsive	Attraction, trusting
Incentives	Our responses to incentives are shaped by predictable mental shortcuts such as strongly avoiding losses.	Impulsive	Greed, fear
Norms	We are strongly influenced by what others do.	Impulsive Habit	Belonging Motor
Defaults	We “go with the flow” of preset options.	Impulsive	Fear, comfort
Salience	Our attention is drawn to what is novel and seems relevant to us.	Habit	Mental
Priming	Our acts are often influenced by subconscious cues.	Habit	Motor
Affect	Our emotional associations can powerfully shape our actions.	Impulsive	Disgust, fear, attraction
Commitments	We seek to be consistent with our public promises and reciprocate acts.	Impulsive Habit	Status Motor
Ego	We act in ways that make us feel better about ourselves.	Impulsive	Status, self-worth

2008) target the goal-directed system and are supposed to persuade or train recipients to adopt a specific behavior. Such techniques might include “provide information about behavior-health link,” “provide information on consequences,” “plan social support,” “prevent relapse,” “prompt intention formation,” “prompt specific goal setting,” or “prompt review of behavioral goals.” Economists and psychologists have also convincingly demonstrated that people respond to “incentives,” which usually activate reflective thinking and motivation by changing the evaluation of the available courses of action (e.g., people rationally respond to changes in prices and costs). In contrast, nudge theory, and the Mindspace framework in particular, provide a list of BCTs that target the automatic decision processes. Mindspace is a mnemonic representing an elaborated and extended version of the nudge approach, which outlines the nine most powerful contextual influences on automatic behavior. In summary, different BCTs influence distinct components of our framework; however, because our objective here is to discuss the theory and practice of nudging health behaviors, Mindspace is the focus of this article.

Understanding Nudges—The Mindspace Way

Mindspace is a mnemonic that reflects an attempt by the group that developed it to gather up the most robust effects on behavior that operate largely through automatic neurobiological systems and psychological processes. The Mindspace elements—messenger, incentives, norms, defaults, salience, priming, affect, commitment, and ego—have demonstrable evidence supporting their use as behavior change techniques (Dolan et al. 2012). In table 1, we summarize these effects (BCTs) alongside the main brain system (third column) and psychological processes (fourth column) generated by those brain systems that are involved in generating behavior, and thus we can explain the Mindspace techniques and the examples discussed here. We do not claim that this is the only system in operation but rather highlight the system that is likely to do most of the “heavy lifting” (in this respect, we note that messenger, incentives, norms, and commitment could also be implemented in ways that involve reflective motivation, although in most cases they would be focusing on automatic processes). We focus on illustrating the workings of nudge theory while acknowledging that some nudge interventions are better explained by different combinations of these underlying mechanisms.

Mindspace in Action

The evidence is structured according the Mindspace framework (see table 1), which was developed using a mixed-methods study design incorporating an extensive literature review. We refined our ideas after testing them with expert panels and interviews with senior policy makers and behavioral scientists. We provide examples of how each of Mindspace element has been applied to address specific challenges in health care (the behavioral interventions cited under each Mindspace element address some of the most prominent challenges).

Messenger

We are heavily influenced by who communicates information to us. The weight we give to information depends greatly on the reactions we have to the source of that information. For example, we are influenced by both the perceived

authority of the messenger and the feelings we have for the source of the message, often discarding information from people we do not like (Cialdini 2007; Webb and Sheeran 2006). So we see that physicians are significantly more likely to trust guidelines from their own professional organizations compared with the same guidelines delivered by insurance companies (Tunis et al. 1994). Similarly, while 76 percent of parents had confidence in the advice on vaccinations provided by their child’s pediatrician, just 23 percent endorsed the advice of government experts or officials (Freed et al. 2011).

Effective communication is an integral part of health promotion strategies, and messages are more likely to create an impact if they use a credible source for the population being targeted (Glik 2007). A meta-analysis of 166 HIV prevention interventions found that expert interventionists produced greater behavior change than nonexperts and that demographic and behavioral similarity between the interventionists and recipients facilitated behavior change (Durantini et al. 2006). Policy makers appear to be taking note of people’s impulsive tendency to trust or distrust advice depending on the source of the information, with the U.K. government thinking about who the messenger is in interventions around reducing levels of obesity and teenage pregnancy (Behavioral Insights Team 2011).

Incentives

Our responses to incentives are often shaped by impulsive but predictable mental shortcuts, and insights from behavioral economics can be used to “supercharge” incentive schemes (Volpp et al. 2011). For example, it is known that we strongly prefer avoiding losses more than we like gains of the same amount, a tendency known as loss aversion (Kahneman and Tversky 1979). Such impulsive avoidance is triggered by automatic fear responses in the brain (De Martino et al. 2006). A randomized trial of incentives for encouraging weight loss found they could be effective—at least in the short term—when people risked losing money (Volpp et al. 2008), in contrast to a previous systematic review that found little effect on weight loss by offering a standard financial incentive (Paul-Ebhohimhen and Avenell 2008). Insights from behavioral economics are increasingly being incorporated into interventions targeting health-related behaviors, including medication adherence and health screening opportunities (Mantzari et al. 2015).

Norms

We are strongly influenced by what others do. Because of innate impulses to belong and to seek affiliation with groups and similar others, the influence of what others around us are doing can be a powerful driver of our own behavior (Fiske 2010). Two main forms of social influence can be distinguished: informational (telling people what is commonly done) and normative social influence (informing them what is widely approved) (Deutsch and Gerard 1955). Using norms as cues for behavior change is often reported in the literature and is usually based on telling people what others are doing in a similar situation (Burger and Shelton 2011; Cialdini 2003, 2007).

Conformity with local social norms has been seen to be a powerful driver of preventive behaviors.

Conformity with local social norms has been seen to be a powerful driver of preventive behaviors, and it has been shown to be effective in interventions encouraging hygiene

behaviors, healthy food choice, and exercise and discouraging alcohol misuse (Burger et al. 2010; Burger and Shelton 2011; Curtis, Danquah, and Aunger 2009; Perkins and Craig 2006). The Behavioral Insights Team in the United Kingdom has supported a social norms approach to reducing harmful drinking at British universities that the team is soon to report (Murphy et al. 2012).

It is important to recognize that providing *norms* information can also have negative effects on behavior. For instance, providing information about low participation in cancer screening actually demotivated members of the public to take up screening opportunities compared with control groups (Sieverding, Decker, and Zimmermann 2010). Norms also help explain “contagious behavior” through large, interconnected social networks: for example, people are more likely to be obese or smoke if others around them share these characteristics or behaviors (Christakis and Fowler 2007, 2008).

### Defaults

We tend to “go with the flow” of preset options. Defaults are the options that are preselected if an individual does not make an active choice. The key feature of default options is that they can have a powerful impact on behavior without necessarily restricting choice (Sunstein and Thaler 2003). This is because losing the default might loom larger than gaining the alternative option (De Martino et al. 2006) or because of the impulsive overvaluation of immediate and undervaluation of delayed rewards/costs (McClure et al. 2004). The most powerful example of the use of defaults in public policy is the impact of automatic pension enrollment, where an opt-out default has been seen to significantly improve participation (Madrian and Shea 2001). In health care, powerful effects of defaults on behavior have also been observed in organ donation decisions and employees’ contributions to health care flexible spending accounts (Johnson and Goldstein 2003; Schweitzer, Hershey, and Asch 1996). With this knowledge, many countries are now wrestling with how best to choose health-related defaults—particularly in relation to organ transplant register (Moseley and Stoker 2015).

All too frequently, default settings are chosen on the basis of natural ordering or convenience rather than to promote welfare. As people often lack established preferences regarding their choices in health care, Halpern, Ubel, and Asch (2007) suggest, those setting the defaults should use them where they can to improve outcomes rather than worsen them. In an intensive care setting, dramatic improvements in outcomes have been seen when lung-protective settings and breaks in sedation for ventilated patients were ordered unless otherwise indicated by a physician (ARDSN 2000; Kress et al. 2000).

### Salience

Our attention is drawn to what is novel and seems relevant to us. As humans have limited perceptual and cognitive resources, choices tend to be affected by anything that falls within the focus of our limited attention span (Kahneman and Thaler 2006). It is also known that people automatically use mental habits such as heuristics, making decisions only on the basis of a single most

salient or important criterion at a time and ignoring other relevant information (Gigerenzer, Hoffrage, and Goldstein 2008; Seymour, Singer, and Dolan 2007). This was applied in a field intervention testing whether information on HIV risk could change sexual behavior among teenagers in Kenya (Dupas 2011). Providing information about a single criterion—the relative risk of HIV infection by the partner’s age group—led to a 28 percent decrease in teen pregnancy and a 61 percent decrease in the incidence of pregnancies with older, riskier partners. In contrast, there was no significant decrease in teen pregnancy after the introduction of a very costly national HIV education curriculum that provided information about the risk of HIV and did not focus the message on the risk distribution in the population.

### Priming

Our behavior is influenced by subconscious cues. Priming cues send excitatory signals between perceptual features and motor programs that have been frequently executed in connection with such features, which are known as behavioral schemata or motor habits (Strack and Deutsch 2004). An individual’s subsequent behavior can be altered if he or she is first exposed to certain environmental influences such as words, sights, and smells. For example, exposing people to words such as *fit*, *lean*, *active*, and *athletic* makes them more likely to use the stairs instead of the elevator (Wryobeck and Chen 2003). Priming is perhaps the least understood and explored element of Mindspace, but evidence exists supporting the practical impact of such primes. For example, when children were exposed to food advertisements, they appeared to be primed to significantly increase their total food intake (Halford et al. 2007). It has also been demonstrated that the amounts of food people serve and consume can vary depending on the size of the food containers used. Participants in an experimental study served themselves 53 percent more calories and consumed 56 percent more calories than those taking food from a smaller bowl (Wansink and Cheney 2005). Our research team recently demonstrated that the hand hygiene of visitors to a surgical intensive care unit was significantly enhanced through specific olfactory and visual primes (King et al. 2015).

### Affect

Our emotional associations can powerfully shape our actions. Emotion is a powerful automatic force in decision making and can powerfully shape actions. Cues evoking disgust have been seen to have a powerful effect on behavior compared with traditional behavior change models relying on providing health information alone. For example, the failure to wash hands after toilet use was identified as a major public health issue in Ghana. It was found that Ghanaians tend to wash their hands when they were felt to be dirty, and previous approaches that attempted to inform and change health behaviors had been unsuccessful. An intervention campaign including a widely seen television commercial focused on provoking disgust at not washing hands rather than just simply promoting soap use. This resulted in a 13 percent increase in the use of soap after using the toilet and a 41 percent increase in reported use before eating (Curtis, Garbrah-Aidoo, and Scott 2007).

---

Cues evoking disgust have been seen to have a powerful effect on behavior compared with traditional behavior change models relying on providing health information alone.

---

## Commitment

We seek to be consistent with our public promises. People deliberately make commitments, as they are all too aware of their impulsive weaknesses and tendency to procrastinate. The power of commitments was aptly demonstrated by the *save more for tomorrow plan*, in which a precommitment to increasing savings contributions with pay raises led to the average savings rate for the participants increasing from 3.5 percent to 11.6 percent (Thaler and Benartzi 2004). People wishing to stop smoking or exercise more have long used commitment devices, and there is some limited evidence of their effectiveness (Bosch-Capblanch et al. 2007). A randomized controlled trial showed that African American women signing a behavioral contract were significantly more likely to reach their exercise goals than a control group in which no commitment was made (Williams et al. 2006). The Behavioral Insights Team is trialing commitment devices in areas including smoking cessation and physical activity (Behavioral Insights Team 2011).

It may be that commitment contracts are made more effective if there is more than just a reputational loss at stake. A commitment contract known as CARES for smoking cessation asked people to make a voluntary commitment to stop smoking. In addition, they pledged their own money that they would pass a urine test for nicotine metabolites six months later. If the test was negative, they would have the money returned to them (without interest), but if they failed, the money would be donated to charity. Those signing up for the CARES contract were more likely to pass the six-month test as well as a surprise test at 12 months than a control group, indicating that such a scheme could produce lasting smoking cessation (Giné, Karlan, and Zinman 2008).

## Ego

We act in ways that make us feel better about ourselves. We behave in ways that support the impression of a positive and consistent self-image, which is caused by innate impulses to behave in ways that enhance our social status (Bateson, Nettle, and Roberts 2006; Curtis, Danquah, and Aunger 2009; Haley and Fessler 2005). A number of studies have demonstrated that unfavorable social images of the type of person who engages in specific risk behavior (e.g., the “typical” smoker or drinker) are associated with less willingness to engage in such behaviors, including unprotected sex (Gibbons, Gerrard, and McCoy 1995), drinking (Gerrard et al. 2002), driving under the influence (Gibbons et al. 2002), and smoking (e.g., smokers with negative images of smokers are more likely to be successful at quitting) (Gerrard et al. 2005). Also, individuals exposed to a manipulation with favorable characteristics of images of people who exercise (e.g., appearance, general health, energy level, attitude toward life, achievements, social relationships) increased their exercise behavior (Ouellette et al. 2005).

## Discussion

Traditional ways of changing behavior, such as legislation, regulation, and incentives, can be very effective. Behavioral economics does not attempt to replace these methods. Rather, it extends and enhances them, adding new dimensions that reflect

fundamental but often neglected influences on behavior. This article reveals how recent insights from behavioral economics, such as the nudge approach, could provide a powerful set of new and refined policy tools to use when trying to influence behaviors in health (Allcott and Mullainathan 2010; Marteau, Hollands, and Fletcher 2012). To date, the use of such insights has been hindered by the lack of a coherent theory explaining their mechanisms of action and a practical framework for designing interventions.

The purpose of this article is twofold. The first purpose is to offer a novel theory explaining how nudges cause behavior change that is based on recent advances in cognitive neuroscience (especially the distinction between the motor and mental habit system and the impulsive system generating specific motivational states). Second, the practical aim is to reveal how recent insights from behavioral economics, such as the nudge approach, could provide a powerful set of new and refined policy tools to use when trying to influence behaviors in health. This objective is achieved by providing convincing examples of nudge effects on behavior change in health, which are systematized in a framework (MindSpace) that provides a useful checklist for policy makers and practitioners. The examples also provide suggestive evidence to develop future interventions guided by these elements and behavioral economics. Thus, given the lack of sufficient evidence of behavioral economics intervention at the population health level, this article contributes to increasing such research.

## Ethics of Nudging

The potential impact of the choice architecture on health-related behavior change (Thaler and Sunstein 2008) does raise questions about who decides on this architecture and on what basis. Many people dislike the thought of government intruding into areas of personal responsibility, although they also realize that the state should have a role in behavior change, especially when one person's behavior has consequences for other people. This is not just relevant to health-related behaviors but also across public policies where interventions utilizing MindSpace interventions are being applied.

---

Before policy makers consider how they can apply new insights, they need to determine whether they should be attempting to change behavior in the first place.

---

Before policy makers consider how they can apply new insights, they need to determine whether they should be attempting to change behavior in the first place. In this respect, it is vital that whenever possible the public's views are taken into account, and permission sought, when introducing interventions. The legitimacy of government and health policy practitioners rests on the fact that they

represent and serve the people, and therefore it may be useful for choice architects to engage better with citizens to explore what is and is not acceptable.

The well-being consequences of nudges come in various guises. We can distinguish three broad accounts of well-being: (1) objective lists—well-being improves when people get more of the things that others decide are good for everybody; (2) preference satisfaction—well-being improves when individuals are able to satisfy more of their desires; and (3) mental states—well-being improves with better thoughts and feelings about life and one's experiences (Parfit 1984). Differentiation between preferences and feelings resonates



with recent neurobiological evidence dissociating psychological components of reward (Berridge, Robinson, and Aldridge 2009).

Public policy has principally been about an “objective list” account—ensuring that people get better health and education, for example, often irrespective of whether they want or like it. The private sector constantly nudges consumers to buy more goods and services, and markets work reasonably well to satisfy revealed preferences. Public sector nudges can be assessed according to the degree to which they show up in all accounts of well-being, including the “liking” account—do individuals report feeling happier after they have been nudged in a particular direction? The liking account will also be important as a cause of behavior change as well as a consequence: for example, satisfaction (well-being) and behavior maintenance go hand in hand in weight loss and smoking cessation (Baldwin et al. 2006; Finch et al. 2005; Hertel et al. 2008).

Of course, public acceptability should not be the only reason for going forward with behavior change. Consider, for example, the shifts in attitude of the public following the introduction of daily charges for drivers entering central London, where support grew considerably following its introduction (Knott, Muers, and Aldridge 2008). The effect of experiences on preferences is an underresearched area (Berridge, Robinson, and Aldridge 2009), and it could be that what people want before a policy is different from what they want after it. Here we propose that better theoretical modeling of shifts in preferences or opinions and also changes in well-being (Dolan and White 2007), given the expected impact of an intervention, could provide enhanced permission for intervention.

Our perspective on whether policy makers should be using nudge-type tools follows closely that of “libertarian paternalists,” who argue that it is “both possible and legitimate for private and public institutions to affect behavior while also respecting freedom of choice” (Thaler and Sunstein 2003, 1159). The simple fact is that individuals are constantly being influenced by and influencing others. The choice environment is rarely neutral, and choice architects will always be shaping decisions, whether people like it or not. We argue that whenever possible, policy makers should be doing what they can to construct the choice environment in a way that is more likely to improve health and well-being than to worsen it.

### **Intervention Design**

Intervention design usually begins with a comprehensive analysis of the behavioral problem or goal. This analysis usually involves a mixed-methods approach (Creswell and Plano Clark 2011), employing surveys, interviews, and/or observations of the populations in question in order to understand the underlying barriers preventing, and enablers driving, the target behavior. Thus, after understanding that a specific behavior can be driven by goals, impulses, and habits (figure 1), the framework presented in table 1 can also be used in analysis of the barriers to and potential drivers of behavior change (i.e., the Mindspace nudges that are likely to be effective in specific circumstances). In this way, our comprehensive theoretical framework for understanding behavior ensures that the most appropriate intervention is implemented once we have better understanding of the role of various determinants in health behaviors.

For example, some people may not be reflectively motivated to do physical activity, while others may be rationally motivated but their social circle is not—that is, the behavior is not a norm. For the former individuals, the intervention could contain reflective motivational techniques such as “providing information on consequences,” “prompting barrier identification,” “prompting specific goal setting,” and “prompting review of behavioral goals” (see Abraham and Michie 2008; Michie et al. 2013), while for the latter group, providing information about “social norms,” such as testimonials from people most similar to the target audience, should have a powerful yet automatic influence on motivation (i.e., it is important to inform people that they are not only behaving in ways that are desirable but continue to be similar to others just like them). Similarly, establishing respondents’ need to “belong” and their desire to behave like people like them would reveal whether providing cues signaling “social norms” is the appropriate intervention technique. Policy makers or health practitioners who are attempting to influence behavior should be aware of these effects and understand how they can be used.

We certainly do not suggest that Mindspace offers answers to all the challenges individuals face. We support the use of conventional policy tools such as legislation and price changes when and where they work. In the case of alcohol, for example, evidence suggests that increasing the price of drinks may be a powerful motivator in reducing alcohol consumption (Purshouse et al. 2010), and we certainly should not ignore these methods. This example is classic economic use of the “I” of Mindspace. Incentives, norms, and salience could all be used to help make existing laws about not serving alcohol inappropriately work better—at the moment, there is little incentive to enforce the law, no norm behavior, and the law is surely far from being salient to many bar staff serving alcohol. In addition, defaults of smaller measures of alcohol could be used or social marketing campaigns informing people of the true consumption levels of relevant others.

### **Future Directions**

There is still much that is unknown about the Mindspace elements and the nudge approach in general. There remains uncertainty over how long the nudge effects last and how well they work in different segments of the population, health conditions, and behavioral domains (Marteau et al. 2011; Marteau, Hollands, and Fletcher 2012; Sheeran, Gollwitzer, and Bargh 2013). Recent work has identified two types of interventions: those that are most effective soon after they are administered and those that induce lasting changes (Rogers and Frey 2015). For example, defaults, salience, and priming are more likely to affect behavior when they are associated with short intervention-behavior lags (the nudging stimulus is delivered just before the decision to act), while correcting inaccurate but important beliefs can help interventions have a longer impact. We also do not yet have a full understanding of the potential impact of such policies on status inequalities—the association between socioeconomic status (education and income) and health, although tools acting on the automatic system may be less likely to be dependent on education and income and therefore a more equitable way of influencing behavior. Antismoking advertisements that contained highly emotional elements were found to have greater impact on people with low and middle socioeconomic status than among high-socioeconomic status groups

(Durkin, Biener, and Wakefield 2009). We need to remain vigilant of compensating behaviors and spillover effects that can result from behavioral interventions. The finding that most people put weight on following successful attempts to quit smoking or that high levels of exercise may result in compensatory mechanisms—such as overeating—suggests the need for joined-up thinking and clarity about the overarching objectives of policy (Church et al. 2009; Parsons et al. 2009).

All these questions will only be answered by the rigorous evaluation of interventions, ideally through field experiments. Indeed, there is an increasing number of studies from the field to draw evidence from, although much of it is outside the health domain (DellaVigna 2009). More evidence should come from the explosion of interest in health-related behavior change, not least from the work of the U.K. Behavioral Insights Team. Future research should target these limitations in order to provide solid evidence for population-wide interventions and health policy. Future research should also determine the relative effectiveness of the various nudging techniques for different health behaviors. In so doing, we can develop basic behavioral science into evidence-based policy. In general, it is likely that the most effective and sustainable changes in behavior will come from the successful integration of different techniques. It is now time to more rigorously develop the specifics of interventions that join up interventions that seek to change behavior through more subtle nudges alongside the harder “shoves” of legislation.

## Acknowledgments

All authors contributed to the work underpinning the original development of the Mindspace framework and the literature search and writing of this review. They would like to thank David Halpern and Michael Hallsworth, who were coauthors of the original Mindspace report, and Rob Metcalfe, who has collaborated with this on developing the framework. The authors are grateful to the U.K. Cabinet Office for financial support toward the original Mindspace report.

## Notes

1. “Traditional” in the policy context has meant neoclassical economics, while traditional approaches in psychology encompass theories from social and health psychology developed in the last five decades or so that have attempted to understand the determinants of health behavior. In psychology, health behavior was initially conceptualized in terms of theories from social psychology such as self-efficacy theory (Bandura 1977), social-cognitive theory (Bandura 1986), the theory of reasoned action (Fishbein and Ajzen 1975), and the theory of planned behavior (Ajzen 1991). The field was further developed by theories from health psychology that specifically focused on health behaviors, such as protection motivation theory (Rogers 1983), the health-belief model (Janz and Becker 1984), and stage approaches (e.g., Prochaska, DiClemente, and Norcross 1992; Schwarzer 1992; Weinstein and Sandman 1992). Those “traditional” models commonly assume that “health behavior is the result of cognitive appraisal processes of the (a) expectancy and value of potential health threats and (b) possible coping responses. From these appraisal processes, a behavioral decision to reduce the health threat may be formed” (Hofmann, Friese, and Wiers 2008, 113).
2. Those emotions are specifically defined: *belonging* is seeking to conform so as to reap the benefits of social living; *attraction* is being attracted to, and wanting to attract, high-value mates; *comfort* is the desire to place one’s body in optimal

physical and chemical conditions; *disgust* is provoked by, and brings desire to avoid, objects and situations carrying disease risk; *fear* is triggered by, and aims to avoid, objects and situations carrying risk of injury or death; *nurture* is a want to care for offspring; *status* is a rewarding state and ignites seeking to optimize social rank; *self-worth* is a need for viewing one’s self as basically worthy or improvable; and *trusting* is a need to view others as basically benign (see Curtis, Danquah, and Aunger 2009; Fiske 2010; Rolls 2014).

## References

- Abraham, Charles, and Susan Michie. 2008. A Taxonomy of Behavior Change Techniques Used in Interventions. *Health Psychology* 27(3): 379–87.
- Acute Respiratory Distress Syndrome Network (ARDSN). 2000. Ventilation with Lower Tidal Volumes as Compared with Traditional Tidal Volumes for Acute Lung Injury and the Acute Respiratory Distress Syndrome. *New England Journal of Medicine* 342: 1301–8.
- Ajzen, Icek. 1991. The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes* 50(2): 179–211.
- Allcott, Hunt, and Sendhil Mullainathan. 2010. Behavior and Energy Policy. *Science* 327(5970): 1204–5.
- Anderson, John R., Daniel Bothell, Michael D. Byrne, Scott Douglass, Christian Lebiere, and Yulin Qin. 2004. An Integrated Theory of the Mind. *Psychological Review* 111(4): 1036–60.
- Baicker, Katherine, William J. Congdon, and Sendhil Mullainathan. 2012. Health Insurance Coverage and Take-Up: Lessons from Behavioral Economics. *Milbank Quarterly* 90(1): 107–34.
- Baldwin, Austin S., Alexander J. Rothman, Andrew W. Hertel, Jennifer A. Linde, Robert W. Jeffery, Emily A. Finch, and Harry A. Lando. 2006. Specifying the Determinants of the Initiation and Maintenance of Behavior Change: An Examination of Self-Efficacy, Satisfaction, and Smoking Cessation. *Health Psychology* 25(5): 626–34.
- Balleine, Bernard W. 2005. Neural Bases of Food-Seeking: Affect, Arousal and Reward in Corticostriatal Limbic Circuits. *Physiology & Behavior* 86(5): 717–30.
- Bandura, Albert. 1977. Self-Efficacy: Toward a Unifying Theory of Behavioral Change. *Psychological Review* 84(2): 191–215.
- . 1986. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice Hall.
- Bargh, John A., and Tanya L. Chartrand. 1999. The Unbearable Automaticity of Being. *American Psychologist* 54(7): 462–79.
- Bateson, Melissa, Daniel Nettle, and Gilbert Roberts. 2006. Cues of Being Watched Enhance Cooperation in a Real-World Setting. *Biology Letters* 2(3): 412–14.
- Behavioural Insights Team. 2011. *Applying Behavioural Insight to Health*. London: Cabinet Office. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/60524/403936\\_BehaviouralInsight\\_acc.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/60524/403936_BehaviouralInsight_acc.pdf) [accessed March 28, 2016].
- . 2015. *The Behavioral Insights Team Update 2013–2015*. London: Cabinet Office. [http://www.behaviouralinsights.co.uk/wp-content/uploads/2015/07/BIT\\_Update-Report-Final-2013-2015.pdf](http://www.behaviouralinsights.co.uk/wp-content/uploads/2015/07/BIT_Update-Report-Final-2013-2015.pdf) [accessed March 28, 2016].
- Berridge, Kent C., Terry E. Robinson, and J. Wayne Aldridge. 2009. Dissecting Components of Reward: “Liking,” “Wanting,” and Learning. *Current Opinion in Pharmacology* 9(1): 65–73.
- Bosch-Capblanch, Xavier, Katharine Abba, Megan Pictor, and Paul Garner. 2007. Contracts between Patients and Healthcare Practitioners for Improving Patients’ Adherence to Treatment, Prevention and Health Promotion Activities. *Cochrane Database Systematic Reviews* 2007(2): Article CD004808.
- Burger, Jerry M., Heather Bell, Kristen Harvey, Jessica Johnson, Claire Stewart, Kelly Dorian, and Marni Swedroe. 2010. Nutritious or Delicious? The Effect of Descriptive Norm Information on Food Choice. *Journal of Social and Clinical Psychology* 29(2): 228–42.

- Burger, Jerry M., and Martin Shelton. 2011. Changing Everyday Health Behaviors through Descriptive Norm Manipulations. *Social Influence* 6(2): 69–77.
- Cecchini, Michelle, Franco Sassi, Jeremy A. Lauer, Yong Y. Lee, Veronica Guajardo-Barron, and Daniel Chisholm. 2010. Tackling of Unhealthy Diets, Physical Inactivity, and Obesity: Health Effects and Cost-Effectiveness. *The Lancet* 376: 1775–84.
- Chaiken, Selly, and Yaacov Trope. 1999. *Dual-Process Theories in Social Psychology*. New York: Guilford Press.
- Christakis, Nicholas A., and James H. Fowler. 2007. The Spread of Obesity in a Large Social Network over 32 Years. *New England Journal of Medicine* 357: 370–79.
- . 2008. The Collective Dynamics of Smoking in a Large Social Network. *New England Journal of Medicine* 358: 2249–58.
- Church, Timothy S., Corby K. Martin, Angela M. Thompson, Conrad P. Earnest, Catherine R. Mikus, and Steven N. Blair. 2009. Changes in Weight, Waist Circumference and Compensatory Responses with Different Doses of Exercise among Sedentary, Overweight Postmenopausal Women. *PLoS ONE* 4(2): e4515.
- Cialdini, Robert B. 2003. Crafting Normative Messages to Protect the Environment. *Current Directions in Psychological Science* 12(4): 105–9.
- . 2007. *Influence: The Psychology of Persuasion*. New York: Harper Business.
- Creswell, John W., Vicki L. Plano, and Clark. 2011. *Designing and Conducting Mixed Methods Research*, 2nd ed. Thousand Oaks, CA: Sage Publications.
- Curtis, Valerie A., Lisa O. Danquah, and Robert V. Aunger. 2009. Planned, Motivated and Habitual Hygiene Behavior: An Eleven Country Review. *Health Education Research* 24(4): 655–73.
- Curtis, Valerie A., Nana Garbrah-Aidoo, and Beth Scott. 2007. Ethics in Public Health Research: Masters of Marketing: Bringing Private Sector Skills to Public Health Partnerships. *American Journal of Public Health* 97(4): 634–41.
- Darzi, Ara, Steve Beales, Michael Hallsworth, Dominic King, Michael Macdonnell, and Ivo Vlaev. 2011. The Five Bad Habits of Healthcare: How New Thinking about Behavior Could Reduce Health Spending. World Economic Forum Report, World Economic Forum. [http://www3.weforum.org/docs/WEF\\_HE\\_FiveBadHabitsHealthcare\\_IndustryAgenda\\_2012.pdf](http://www3.weforum.org/docs/WEF_HE_FiveBadHabitsHealthcare_IndustryAgenda_2012.pdf) [accessed March 28, 2016].
- De Martino, Benedetto Dharshan Kumaran, Ben Seymour, and Raymond J. Dolan. 2006. Frames, Biases, and Rational Decision-Making in the Human Brain. *Science* 313(5787): 684–87.
- DellaVigna, Stefano. 2009. Psychology and Economics: Evidence from the Field. *Journal of Economic Literature* 47(2): 315–72.
- Deutsch, Morton, and Harold B. Gerard. 1955. A Study of Normative and Informational Social Influences upon Individual Judgment. *Journal of Abnormal and Social Psychology* 51(3): 629–36.
- Dolan, Paul, Michael Hallsworth, David Halpern, Dominic King, Robert Metcalfe, and Ivo Vlaev. 2012. Influencing Behaviour: The Mindspace Way. *Journal of Economic Psychology* 33(1): 264–77.
- Dolan, Paul, Michael Hallsworth, David Halpern, Dominic King, and Ivo Vlaev. 2010. *Mindspace: Influencing Behavior through Public Policy*. London: Cabinet Office. <http://www.instituteforgovernment.org.uk/sites/default/files/publications/MINDSPACE.pdf> [accessed March 29, 2016].
- Dolan, Paul, and Michael White. 2007. How Can Measures of Subjective Well-Being Be Used to Inform Public Policy? *Perspectives on Psychological Science* 2(1): 71–85.
- Dupas, Pascaline. 2011. Do Teenagers Respond to HIV Risk Information? Evidence from a Field Experiment in Kenya. *American Economic Journal: Applied Economics* 3(1): 1–34.
- Durantini, Marta, Dolores Albarracín, Amy L. Mitchell, Allison N. Earl, and Jeffrey C. Gillette. 2006. Conceptualizing the Influence of Social Agents of Behavior Change: A Meta-Analysis of the Effectiveness of HIV-Prevention Interventionists for Different Groups. *Psychological Bulletin* 132(2): 212–48.
- Durkin, Sarah J., Lois Biener, and Melanie A. Wakefield. 2009. Effects of Different Types of Antismoking Ads on Reducing Disparities in Smoking Cessation among Socioeconomic Subgroups. *American Journal of Public Health* 99(12): 2217–23.
- Emanuel, Ezekiel J., and Victor R. Fuchs. 2008. The Perfect Storm of Overutilization. *Journal of the American Medical Association* 299: 2789–91.
- Evans, Jonathan St. B. T. 2008. Dual-Processing Accounts of Reasoning, Judgement, and Social Cognition. *Annual Review of Psychology* 59: 255–78.
- Finch, Emily A., Jennifer A. Linde, Robert W. Jeffery, Alexander J. Rothman, Christie M. King, and Rona L. Levy. 2005. The Effects of Outcome Expectations and Satisfaction on Weight Loss and Maintenance: Correlational and Experimental Analyses—A Randomized Trial. *Health Psychology* 24(6): 608–16.
- Fishbein, Martin, and Icek Ajzen, eds. 1975. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley.
- Fishbein, Martin, Harry C. Triandis, Frederick H. Kanfer, Marshall Becker, Susan E. Middlestadt, and Anita Eichler. 2001. Factors Influencing Behavior and Behavior Change. In *Handbook of Health Psychology*, edited by Andrew Baum, Tracey A. Revenson, and Jerome E. Singer, 3–17. Mahwah, NJ: Lawrence Erlbaum.
- Fiske, Susan T. 2010. *Social Beings: Core Motives in Social Psychology*. New York: Wiley.
- Freed, Gary L., Sarah J. Clark, Amy T. Butchart, Dianne C. Singer, and Matthew M. Davis. 2011. Sources and Perceived Credibility of Vaccine-Safety Information for Parents. Supplement 1. *Pediatrics* 127: S107–12.
- Gerrard, Meg, Frederick X. Gibbons, David J. Lane, and Michelle L. Stock. 2005. Social Comparison and Smoking Cessation: Comparison Level Predicts Success. *Health Psychology* 24(6): 623–29.
- Gerrard, Meg, Frederick X. Gibbons, Monica Reis-Bergan, Linda Trudeau, Linda S. Vande Lune, and Bram Buunk. 2002. Health Cognitions and Adolescent Alcohol Consumption: Inhibitory Effects of Drinker and Non-Drinker Prototypes. *Health Psychology* 21(6): 601–9.
- Gibbons, Frederick X., Meg Gerrard, and Sue Boney McCoy. 1995. Prototype Perception Predicts (Lack of) Pregnancy Prevention. *Personality and Social Psychology Bulletin* 21(1): 85–93.
- Gibbons, Frederick X., David J. Lane, Meg Gerrard, Elizabeth A. Pomery, and Carrie L. Lautrup. 2002. Drinking and Driving: A Prospective Assessment of the Relation between Risk Cognitions and Risk Behavior. *Risk, Decision and Policy* 7(3): 267–83.
- Gigerenzer, Gerd, and Daniel G. Goldstein. 1996. Reasoning the Fast and Frugal Way: Models of Bounded Rationality. *Psychological Review* 103(4): 650–69.
- Gigerenzer, Gerd, Ulrich Hoffrage, and Daniel G. Goldstein. 2008. Fast and Frugal Heuristics Are Plausible Models of Cognition. *Psychological Review* 115(1): 230–37.
- Giné, Xavier, Dean Karlan, and Jonathan Zinman. 2008. Put Your Money Where Your Butt Is: A Commitment Contract for Smoking Cessation. Policy Research Working Paper 4985, World Bank. <http://documents.worldbank.org/curated/en/2009/07/10769626/put-your-money-your-butt-commitment-contract-smoking-cessation> [accessed March 29, 2016].
- Glik, Deborah C. 2007. Risk Communication for Public Health Emergencies. *Annual Review of Public Health* 28: 33–54.
- Glimcher, Paul W., Colin F. Camerer, Ernst Fehr, and Russell A. Poldrack. 2009. *Neuroeconomics: Decision Making and the Brain*. New York: Academic Press.
- Grol, Richard. 2001. Successes and Failures in the Implementation of Evidence-Based Guidelines for Clinical Practice. *Milbank Quarterly* 76(4): 517–63.
- Grol, Richard, and Jeremy Grimshaw. 2003. From Best Evidence to Best Practice: Effective Implementation of Change in Patients' Care. *The Lancet* 362: 1225–30.



- Haley, Kevin J., and Daniel M. T. Fessler. 2005. Nobody's Watching? Subtle Cues Affect Generosity in an Anonymous Economic Game. *Evolution and Human Behavior* 26(3): 245–56.
- Halford, Jason C.G., Emma J. Boyland, Georgina Hughes, Lorraine P. Oliveira, and Terence M. Dovey. 2007. Beyond-Brand Effect of Television (TV) Food Advertisements/Commercials on Caloric Intake and Food Choice of 5–7-Year-Old Children. *Appetite* 49(1): 263–67.
- Halpern, Scott D., Peter A. Ubel, and David A. Asch. 2007. Harnessing the Power of Default Options to Improve Health Care. *New England Journal of Medicine* 357: 1340–44.
- Hertel, Andrew W., Emily A. Finch, Kristina M. Kelly, Christine King, Harry Lando, Jennifer A. Linde, Robert W. Jeffery, and Alexander J. Rothman. 2008. The Impact of Expectations and Satisfaction on the Initiation and Maintenance of Smoking Cessation: An Experimental Test. Supplement 3. *Health Psychology* 27: S197–206.
- Hofmann, Wilhelm, Malte Friese, and Reinout W. Wiers. 2008. Impulsive versus Reflective Influences on Health Behavior: A Theoretical Framework and Empirical Review. *Health Psychology Review* 2(2): 111–37.
- Hollands, Gareth J., Ian Shemilt, Theresa M. Marteau, Susan A. Jebb, Michael P. Kelly, Ryota Nakamura, Marc Suhrcke, and David Ogilvie. 2013. Altering Micro-Environments to Change Population Health Behaviour: Toward an Evidence Base for Choice Architecture Interventions. *BMC Public Health* 13: 1218. <http://bmcpubhealth.biomedcentral.com/articles/10.1186/1471-2458-13-1218> [accessed March 29, 2016].
- Horton, Richard. 2011. Offline: Nudge. *The Lancet* 377: 192.
- Janz, Nancy K., and Marshall H. Becker. 1984. The Health Belief Model: A Decade Later. *Health Education Quarterly* 11(1): 1–47.
- Johnson, Eric J., and Daniel Goldstein. 2003. Do Defaults Save Lives? *Science* 302(5649): 1338–39.
- Kahneman, Daniel. 2003. Maps of Bounded Rationality: Psychology for Behavioral Economics. *American Economic Review* 93(5): 1449–75.
- . 2011. *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux.
- Kahneman, Daniel, and Richard H. Thaler. 2006. Utility Maximization and Experienced Utility. *Journal of Economic Perspectives* 20(1): 221–34.
- Kahneman, Daniel, and Amos Tversky. 1979. Prospect Theory: An Analysis of Decision under Risk. *Econometrica* 47(2): 263–91.
- . eds. 2000. *Choices, Values, and Frames*. New York: Russell Sage Foundation.
- King, Dominic, Ivo Vlaev, Ruth Everett-Thomas, Maureen Fitzpatrick, Ara Darzi, and David J. Birnbaum. 2015. “Priming” Hand Hygiene Compliance in Clinical Environments. *Health Psychology* 35(1): 96–101.
- Knott, David, Stephen Muers, and Stephen Aldridge. 2008. Achieving Culture Change: A Policy Framework. Discussion paper, Prime Ministers Strategy Unit, Cabinet Office. [https://crawford.anu.edu.au/sparc/pdf/2010/achieving\\_culture\\_change.pdf](https://crawford.anu.edu.au/sparc/pdf/2010/achieving_culture_change.pdf) [accessed March 29, 2016].
- Kress, John P., Anne S. Pohlman, Michael F. O'Connor, and Jesse B. Hall. 2000. Daily Interruption of Sedative Infusions in Critically Ill Patients Undergoing Mechanical Ventilation. *New England Journal of Medicine* 342: 1471–77.
- Loewenstein, George, David A. Asch, Joelle Y. Friedman, Lori A. Melichar, and Kevin G. Volpp. 2012. Can Behavioral Economics Make Us Healthier? *British Medical Journal* 344: e3482.
- Loewenstein, George, Troyen Brennan, and Kevin G. Volpp. 2007. Asymmetric Paternalism to Improve Health Behaviors. *Journal of the American Medical Association* 298: 2415–17.
- Lozano, Rafael, Mohsen Naghavi, Kyle Foreman, Stephen Lim, Kenji Shibuya, Victor Aboyans, et al. 2012. Global and Regional Mortality from 235 Causes of Death for 20 Age Groups in 1990 and 2010: A Systematic Analysis for the Global Burden of Disease Study 2010. *The Lancet* 380: 2095–2128.
- Mackenbach, Johan P., I. Irina Stirbu, Albert-Jan R. Roskam, Maartje M. Schaap, Gwenn Menvielle, Mall Leinsalu, and Anton E. Kunst. 2008. Socioeconomic Inequalities in Health in 22 European Countries. *New England Journal of Medicine* 358: 2468–81.
- Madrian, Brigitte C., and Dennis F. Shea. 2001. The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior. *Quarterly Journal of Economics* 116(4): 1149–87.
- Mantzari, Eleni, Florian Vogt, Ian Shemilt, Yinghui Wei, P. Julian, T. Higgins, and Theresa M. Marteau. 2015. Personal Financial Incentives for Changing Habitual Health-Related Behaviors: A Systematic Review and Meta-Analysis. *Preventive Medicine* 75: 75–85.
- Marteau, Theresa M., Gareth J. Hollands, and Paul C. Fletcher. 2012. Changing Human Behavior to Prevent Disease: The Importance of Targeting Automatic Processes. *Science* 337(6101): 1492–95.
- Marteau, Theresa M., David Ogilvie, Martin Roland, Marc Suhrcke, and Michael P. Kelly. 2011. Judging Nudging: Can Nudging Improve Population Health? *British Medical Journal* 342: d228.
- McClure, Samuel M., David I. Laibson, George Loewenstein, and Jonathan D. Cohen. 2004. Separate Neural Systems Value Immediate and Delayed Monetary Rewards. *Science* 306(5695): 503–7.
- Michie, Susan, Michelle Richardson, Marie Johnston, Charles Abraham, Jill Francis, Wendy Hardeman, et al. 2013. The Behavior Change Technique Taxonomy (v1) of 93 Hierarchically Clustered Techniques: Building an International Consensus for the Reporting of Behavior Change Interventions. *Annals of Behavioral Medicine* 46(1): 81–95.
- Michie, Susan, Maartje M. van Stralen, and Robert West. 2011. The Behaviour Change Wheel: A New Method for Characterising and Designing Behavior Change Interventions. *Implementation Science* 6: 42.
- Mokdad, Ali H., James S. Marks, Donna F. Stroup, and Julie L. Gerberding. 2004. Actual Causes of Death in the United States. *Journal of the American Medical Association* 291: 1238–45.
- Moseley, Alice, and Gerry Stoker. 2015. Putting Public Policy Defaults to the Test: The Case of Organ Donor Registration. *International Public Management Journal* 18(2): 246–64.
- Murphy, Simon, Graham Moore, Annie Williams, and Laurence Moore. 2012. An Exploratory Cluster Randomised Trial of a University Halls of Residence Based Social Norms Intervention in Wales, UK. *BMC Public Health* 12: 186. <http://bmcpubhealth.biomedcentral.com/articles/10.1186/1471-2458-12-186> [accessed March 29, 2016].
- Orbell, Sheina, and Bas Verplanken. 2010. The Automatic Component of Habit in Health Behavior: Habit as Cue-Contingent Automaticity. *Health Psychology* 29(4): 374–83.
- Ouellette, Judith A., Robert Hessling, Frederick X. Gibbons, Monica Reis-Bergan, and Meg Gerrard. 2005. Using Images to Increase Exercise Behavior: Prototypes vs. Possible Selves. *Personality and Social Psychology Bulletin* 31(5): 610–20.
- Parfit, Derek. 1984. *Reasons and Persons*. Oxford, UK: Oxford University Press.
- Parsons, Amanda C., Mujahed Shraim, Jennie Inglis, Paul Aveyard, and Peter Hajek. 2009. Interventions for Preventing Weight Gain after Smoking Cessation. *Cochrane Database of Systematic Reviews* 2009(1): Article CD006219.
- Paul-Ebhohimhen, V., and A. Avenell. 2008. Systematic Review of the Use of Financial Incentives in Treatments for Obesity and Overweight. *Obesity Review* 9(4): 355–67.
- Perkins, H. Wesley, and David W. Craig. 2006. A Successful Social Norms Campaign to Reduce Alcohol Misuse among College Student-Athletes. *Journal of Studies on Alcohol* 67(6): 880–89.
- Prochaska, James O., Carlo C. DiClemente, and John C. Norcross. 1992. In Search of How People Change: Applications to Addictive Behaviors. *American Psychologist* 47(9): 1101–14.
- Purshouse, Robin C., Petra S. Meier, Alan Brennan, Karl B. Taylor, and Rachid Rafia. 2010. Estimated Effect of Alcohol Pricing Policies on Health and Health Economic Outcomes in England: An Epidemiological Model. *The Lancet* 375: 1355–64.



- Rangel, Antonio, Colin Camerer, and P. Read Montague. 2008. A Framework for Studying the Neurobiology of Value-Based Decision-Making. *Nature Reviews Neuroscience* 9: 545–56.
- Rogers, R.W. 1983. Cognitive and Physiological Processes in Fear Appraisal and Attitude Change: A Revised Theory of Protection Motivation. In *Social Psychophysiology*, edited by John T. Cacioppo, and Richard E. Petty, 153–76. New York: Guilford Press.
- Rogers, Todd, and Erin Frey. 2015. Changing Behavior beyond the Here and Now. In *The Wiley Blackwell Handbook of Judgment and Decision Making*, vol. 1, edited by Gideon Keren and George Wu, 725–48. Malden, MA: Wiley.
- Rolls, Edmund T. 2014. *Emotion and Decision-Making Explained*. New York: Oxford University Press.
- Schwarzer, Ralf. 1992. Self-Efficacy in the Adoption and Maintenance of Health Behaviors: Theoretical Approaches and a New Model. In *Self-Efficacy: Thought Control of Action*, edited by Ralf Schwarzer, 217–42. Washington, DC: Hemisphere.
- Schweitzer, Maurice, John C. Hershey, and David A. Asch. 1996. Individual Choice in Spending Accounts: Can We Rely on Employees to Choose Well? *Medical Care* 34(6): 583–93.
- Seymour, Ben, Tania Singer, and Ray Dolan. 2007. The Neurobiology of Punishment. *Nature Reviews Neuroscience* 8: 300–311.
- Shafir, Eldar. 2012. *The Behavioral Foundations of Public Policy*. Princeton, NJ: Princeton University Press.
- Sheeran, Paschal. 2002. *Intention–Behavior Relations: A Conceptual and Empirical Review*. London: Wiley.
- Sheeran, Paschal, Peter M. Gollwitzer, and John A. Bargh. 2013. Nonconscious Processes and Health. *Health Psychology* 32(5): 460–73.
- Shumaker, Sally A., Eleanor B. Schon, Judith K. Ockene, J., and Wendy L. McBee, eds. 2008. *The Handbook of Health Behavior Change*. 2nd ed. New York: Springer.
- Sieverding, Monika, Sarah Decker, and Friederike Zimmermann. 2010. Information about Low Participation in Cancer Screening Demotivates Other People. *Psychological Science* 21(7): 941–43.
- Strack, Fritz, and Roland Deutsch. 2004. Reflective and Impulsive Determinants of Social Behavior. *Personality and Social Psychology Review* 8(3): 220–47.
- Thaler, Richard H., and Shlomo Benartzi. 2004. Save More Tomorrow: Using Behavioral Economics to Increase Employee Savings. *Journal of Political Economy* 112(1): 164–87.
- Thaler, Richard H., and Cass R. Sunstein. 2003. Libertarian Paternalism Is Not an Oxymoron. *University of Chicago Law Review* 70: 1159–1202.
- . 2008. *Nudge: Improving Decisions about Health, Wealth and Happiness*. New Haven, CT: Yale University Press.
- Tunis, Sean R., Robert S.A. Hayward, Mark C. Wilson, Haya R. Rubin, Eric B. Bass, Mary Johnston, and Earl P. Steinberg. 1994. Internists' Attitudes about Clinical Practice Guidelines. *Annals of Internal Medicine* 120(11): 956–63.
- Tybur, Joshua M., and Vladas Griskevicius. 2013. Evolutionary Psychology: A Fresh Perspective for Understanding and Changing Problematic Behavior. *Public Administration Review* 73(1): 12–22.
- U.K. Cabinet Office. 2011. *Behavior Change and Energy Use*. London: Cabinet Office. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/60536/behaviour-change-and-energy-use.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/60536/behaviour-change-and-energy-use.pdf) [accessed March 28, 2016].
- U.K. Department of Health. 2010. Healthy Lives, Healthy People: Our Strategy for Public Health in England. <https://www.gov.uk/government/publications/healthy-lives-healthy-people-our-strategy-for-public-health-in-england> [accessed March 29, 2016].
- Verplanken, Bas, Oddgeir Friberg, Catharina E. Wang, David Trafimow, and Kristin Woolf. 2007. Mental Habits: Metacognitive Reflection on Negative Self-Thinking. *Journal of Personality and Social Psychology* 92(3): 526–41.
- Vlaev, Ivo, and Paul Dolan. 2015. Action Change Theory: A Reinforcement Learning Perspective on Behavior Change. *Review of General Psychology* 19(1): 69–95.
- Volpp, Kevin G., David A. Asch, Robert Galvin, and George Loewenstein. 2011. Redesigning Employee Health Incentives: Lessons from Behavioral Economics. *New England Journal of Medicine* 365: 388–90.
- Volpp, Kevin G., Leslie K. John, Andrea B. Troxel, Laurie Norton, Jennifer Fassbender, and George Loewenstein. 2008. Financial Incentive-Based Approaches for Weight Loss: A Randomized Trial. *Journal of the American Medical Association* 300: 2631–37.
- Wansink, Brian, and Matthew M. Cheney. 2005. Super Bowls: Serving Bowl Size and Food Consumption. *Journal of the American Medical Association* 293: 1727–28.
- Webb, Thomas L., and Paschal Sheeran. 2006. Does Changing Behavioral Intentions Engender Behavior Change? A Meta-Analysis of the Experimental Evidence. *Psychological Bulletin* 132(2): 249–68.
- Weinstein, Neil D., and Peter M. Sandman. 1992. A Model of the Precaution Adoption Process: Evidence from Home Radon Testing. *Health Psychology* 11(3): 170–80.
- Williams, Bernadette R., Janet Bezner, Steven B. Chesbro, and Ronnie Leavitt. 2006. The Effect of a Walking Program on Perceived Benefits and Barriers to Exercise in Postmenopausal African American Women. *Journal of Geriatric Physical Therapy* 29(2): 43–49.
- Wood, Wendy, and David T. Neal. 2007. A New Look at Habits and the Habit-Goal Interface. *Psychological Review* 114(4): 843–63.
- World Health Organization (WHO). 2009. *Global Health Risks: Mortality and Burden of Disease Attributable to Selected Major Risks*. Geneva, Switzerland: World Health Organization.
- Wryobeck, John, and Yiwei Chen. 2003. Using Priming Techniques to Facilitate Health Behaviors. *Clinical Psychologist* 7(2): 105–8.



**STUDYDADDY**

**Get Homework Help  
From Expert Tutor**

**Get Help**