Introduction

Behavioral data science aims to understand and make predictions about human behavior. But sometimes better than knowing what is going to happen is knowing how to change it. We can call this behavior change, persuasion and influence, behavioral engineering, nudging, boosting, and so on. Here I call it behavioral influence, which is meant to encompass all of these.

The research on behavioral influence falls into numerous camps. These include the behavioral economics and decision making literature, the social psychological literature of persuasion and influence, the health psychology literature focused on interventions, and basic and applied psychology. These are not mutually exclusive. Nor is one necessarily the precursor of another. In practice, they are often combined. For example, aspects of Cialdini's (1987) six principles of persuasion and influence (Commitment, Reciprocity, Social proof, Liking, Authority, and Scarcity) are found in Dolan and colleagues' (2012) MINDSPACE (Messenger, Incentives, Norms, Defaults, Salience, Priming, Affect, Commitment, and Ego), which in turn shares features with the interventions in Michie and colleagues (2011) Behavior Change Wheel (Environmental restructuring, Education, Persuasion, Incentivization, Coercion, Training, Enablement, and Modeling). All of these lists also implicitly include the making of a short list—or chunking things into a mnemonic—which follows from basic psychological research (Miller, 1956). In any case, most of these share their territory, explicitly or implicitly, despite sometimes being introduced in different research traditions and with different intents.

Why is this work so useful for the behavioral data scientist? Basically, someone in the business of studying behavioral data needs to have an understanding of why people behave the way they do. What factors are likely to be responsible for human behavior? And what might one manipulate to change that behavior? Behavioral influence sits squarely at the heart of this understanding.

Consider these four questions:

Q1: Why did Texas experience a 44% drop in motorcycle theft from 1998 to 1990?

Q2: Why did the 1973 Sunningdale Agreement fail to end the Troubles in Northern Ireland when the 1998 Good Friday Agreement did, despite them being similar agreements?

Q3: Why did enrolment in UK pension plans among the private sector increase from approximately 50% to almost 90% between 2012 and 2015?

Q4: Why might giving organizations less information about job candidates improve the quality of the people they hire?

One can speculate. In fact, why even speculate? A machine learning algorithm with some data would spit out some answers. Job done. But in reality, the quality of those answers will be severely limited by the quality of the data and the theories brought to bear in analyzing them. Indeed, the data alone can easily turn into a Pandoras box. Too many variables, often highly correlated with one another, combined with the simple fact that machine learning algorithms do not understand what the variables mean, can lead to fabulous failures (Hills, 2018; Lazer, Kennedy, King, & Vespignani, 2014; O'Neil, 2016). This can also create tremendous amounts of tail chasing and wasted time. Moreover, secondary data (the kind you get from someone else) is rarely collected with your particular research question in mind. It is therefore unlikely to represent the kind of experimental manipulation that would allow one to infer causality or rule out alternative hypotheses. Data-driven science is a nice idea, but data does not collect itself and any measurement is an implicit theory about what is worth measuring. If one has a richer understanding of what drives behavior, then one knows better what data to collect and what questions to use when analyzing them.

Good theories of human behavior represent the collected inferences across thousands if not millions of studies. The most likely answers to the above questions all rely on understanding general principles of human behavior. Why did motorcycle theft decline in Texas? Because *when something gets harder, people are less likely to do it:* recently introduced helmet laws in Texas meant that motorcycle thieves had to remember to carry around a helmet in order to avoid being stopped while riding away with their new prize (Halpern, 2015). Why did the Good Friday Agreement succeed where the Sunningdale Agreement had failed? Because *people value things more when they help to create them:* The Good Friday Agreement, though often called "Sunningdale for slow learners," was more inclusive and brought all parties to the negotiation table in its construction and signing (Tonge, 2000). *People tend to go along with the options they are given:* In 2012, UK employers began automatic enrolment in pension plans, allowing employees to opt-out, as opposed to the previous policy of allowing employees to opt-in (Cribb & Emmerson, 2020). *People are easily biased by information that reduces the quality of their decisions:* when people can see who is auditioning for an orchestra seat, they choose poorer players than when choosing based on the quality of the auditory performance alone; blind auditioning leads to an increase in the hiring of female musicians (Goldin & Rouse, 2000).

The value to the data scientist of understanding behavioral science cannot be overstated. The World Health Organization (2009) estimates that behavior (e.g., alcohol consumption, tobacco use, motor vehicle accidents, and poor diet) is responsible for more than half of all healthy life years lost. Add to this the human contribution to climate change, pollution, poorly distributed resources that lead to poverty and malnutrition, refugees from war, pandemics (e.g., AIDS and COVID), loss of wellbeing due to inequality and social comparison, mismanagement of land and resources, misinformation, hate crime, and so on, and we find that behavior underlies many of the world's woes as well as potentially holding the key to resolving them.

Do we really need behavioral influence though? Why not simply incentivize: subsidize the actions we want to see and tax those we don't? This is a long-standing, but changing, economic view. It is changing because the evidence shows incentives are often weak forces of influence and, worse, they often work in contrast to our expectations. Implement a fine for picking up children late at the daycare center and suddenly more parents pick their children up late (Gneezy and Rustichini, 2000a). Offer to pay people a small amount for each task they complete, and suddenly they do fewer tasks than if you had not paid them at all (Gneezy and Rustichini, 2000b). Offer to pay them too much and they fail to perform as well as they do when paid less (Ariely, Gneezy, Loewenstein, & Mazer, 2009). A survey of 50 studies evaluating the impact of incentives on social preferences found many instances of *crowding-out*; people quickly replace internal incentives with external incentives, which can be weaker than or counter to the internal incentives they replace (Bowles & Polania-Reyes, 2012; Kamenica, 2012). We are not *Homo economicus*. People simply do not respond to incentives in the way you might expect of a well-behaved extrinsic-reward-loving robot.

How do we create a framework for thinking about the vast variety of behavioral influences? It is not easy to pick a single existing framework. Nor would dismissing the variety be a service to the reader. Ideally, we would like a sufficient breadth of knowledge to provide both a vocabulary and a grammar for understanding behavioral influence. Moreover, we would like a coherent way to organize them so we can put them to use effectively. We need a mnemonic for our mnemonics. I will not be providing that. Existing mnemonics mix modes of delivery with policy suggestions, influence strategies, and characteristics of the source and recipient, among other things. Instead, I have chosen to focus on the behavioral process itself. This provides a useful scaffolding for pinning down the vast majority of behavior influence approaches. It is not a substitute for the knowledge it organizes. It is also bound to leave a few things out. If you find some, please let me know.

The ABCs of Behavioral Influence: Attention, Behavior, Consequences

If we come at behavior with the cool disinterest of an alien observer, we are likely to notice three things. Behavior starts, it happens, and then it ends. It starts because something captures *attention*: the actuator, a cue, a motivator, signal, context, or stimulus. It happens because the *behavior* is known or the environment provides appropriate affordances—properties of the environment that guide the behavior. It ends because *consequences* are achieved or there are no further apparent actions to take to achieve them. In many cases anticipating the consequences can help initiate the behavior to begin with. Here I use the ABCs of Behavioral Influence to refer to these three components: attention, behavior, and consequences.

This simplified arrangement allows us to ask and answer a simple question: *Why do some behaviors not occur*? The answer is that attention was not captured ("we forgot"), the behavior was not known ("we didn't know what we were supposed to do"), or it was interrupted ("it was all so complicated and then I got sidetracked by an email"), or the consequences were unknown or undesirable ("we didn't think it would matter"). Or it may be some combination of these. All other things being equal, the more effectively our attention is captured, the easier the behavior, the more desirable the consequences, and the better we are at eliminating interruption, the more likely we are to see a behavioral stimulus lead to a desirable outcome.

The ABCs highlight the many powerful answers that other frameworks provide. What makes a good cue? What makes a good behavior? What makes a good consequence? The majority

of approaches to behavioral influence all focus on answering these important questions. Some focus on the best ways to capture attention, like timely texts, omnipresent signage, social cues, or creating memorable intentions. Some focus on behavior, educating people about what to do or changing how easy it is to do it. Others focus on emphasizing the consequences.

Attention, behavior, and consequences are not mutually exclusively. Consequences can capture attention. Consequences can guide behavior, such as when behavior is gamified. And behavior can guide attention, such as when past behavior in a specific context tends to drive future behavior in that context. Many effective behavioral influence strategies require none of these, such as when our utility provider signs us up for automatic payments so that we no longer need to attend to, remember how to, or further worry about the consequences of not paying our bills.

In what follows, I elaborate on the ABCs, pointing out where they connect with popular approaches to behavioral influence, how they fit together, and using them to highlight features of behavioral influence that can often be found across approaches. Few of these features are exclusive to A, B, or C, and many of them are found throughout.
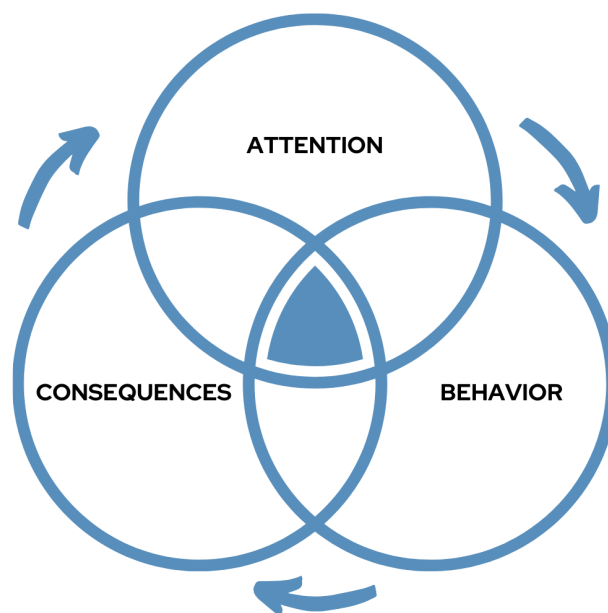

Figure 1: The ABCs of Behavioral Influence represent the components that drive behavioral outcomes: attention, behavior, and consequences. Most approaches to behavioral influence address one or more of these components and some of the most effective approaches address them all. The arrows on the exterior signify time, but approaches to behavioral influence can occur throughout the lifecycle of a behavior.

Attention

Much of the effectiveness of behavioral influence focuses on capturing people's attention. Because attention is a limited resource and competition for our attention has only increased as information sources have proliferated (Simon, 1971; Hills, 2019; Menczer & Hills, 2020), the importance of capturing attention cannot be overstated. Poor external cues are routinely

responsible for human-caused disasters. These can include *misinterpreted cues*: the 1979 nuclear accident on Three Mile Island is often blamed on a misinterpreted warning light; *unidentified or absent cues*: The British Car Ferry, Herald of Free Enterprise, sank in 1987 because the captain thought the bow doors were closed and there was no indicator to suggest otherwise (Wittingham, 2004); and *distracting cues*, which are blamed for approximately 1 in 4 car accidents (National Safety Council, 2011). Poor internal cues can be equally disastrous: *failures of self-cueing* (prospective memory) are responsible for more than half of all memory failures (Crovitz &Daniel, 1984). These can account for missed appointments, failures to take medication, overlooked bills, and the kinds of failures to act on intentions that happen to us all with unceasing regularity.

In the absence of an appropriate internal cue, we rely on external cues to guide us. The majority of behavioral influence methods focus on the many ways that external cues capture attention. In the Yale Attitude Change approach, which summarizes influence in relation to *who* is saying *what* to *whom*, the who component is designed to help capture attention and motivate behavior (Aronson, Wilson & Akert, 2010). In the MINDSPACE framework, messenger (M)—the 'who'—salience (S)—the noticeability of the cue—and priming (P)—cues designed to prepare and guide attention—all explicitly address characteristics of attention (Dolan et al., 2012). In the Behavioural Insights Team's EAST framework (Easy, Attractive, Social, and Timely), attractive (A), social (S), and timely (T) reflect mechanisms for achieving the capture of attention, sometimes by focusing attention on the consequences (Halpern, 2014). The DEFRA (2008) model, aimed at promoting pro-environmental behavior, centers around four E's (engage, encourage, enable, and exemplify); 'engage' is about capturing attention.

Availability

Availability is typically considered an internal cue and can be defined as what comes to mind when it comes time to act. Many behavioral influence approaches try to control what comes to mind by focusing on intentions and sometimes more vaguely on 'awareness'. Unfortunately, intentions and awareness are not by themselves good at capturing our attention, at least not sufficiently enough to motivate behavior. The *theory of planned behavior*—which relies on *attitude, subjective norms,* and *perceived behavioral control* to create *intentions* which then lead to behavior—is one prominent framework for thinking about behavior change. However, Sutton and Sheeran (2003) studied the theory of planned behavior and found in a meta-analysis of intentions involving 54 studies and 8166 participants that intention alone explained only about 7% of the variance in predicting future behavior.

One might conclude that what people intend to do is less important than what the environment affords. But that is not entirely so either. It is how we use intentions that matter. Having people form *implementation intentions*, by imagining *what, when*, *where*, and *how* a behavior will be initiated is dramatically effective. A meta-analysis involving 94 studies with 8461 participants found an effect size of $d = .65$ (Gollwitzer and Sheeran, 2006). When people wield their intentions to envision the details of future action, this helps make those actions available to attention when the opportunity for those actions arises.

Implementation intentions and other effective internal cues for capturing attention rest solidly on memory research about what comes to mind. We remember things that include visual imagery, semantic elaboration that engages with meanings and associations, emotional

content, and self-referential processing (thinking about how the content relates to oneself). These are all things that are evoked by implementation intentions (Chasteen, Park, & Schwarz, 2001; Spreng, Madore, & Schacter, 2018; Anderson, McDaniel, & Einstein, 2017). While imagining things may not be the same thing as being there, it appears to make being there and acting accordingly more likely (e.g., Milkman, Beshears, Choi, Laibson, & Madrian, 2011).

Imagining doing something is a useful way to guide availability for future attention, but it turns out that having actually done that something is even better. Though intentions are a poor predictor of future behavior, the same meta-analyses cited above found that past behavior is an excellent predictor of future behavior (Gollwitzer & Sheeran, 2006). Bem's (1972) self-perception theory and Chater's (2019), *The Mind is Flat*, are both based on the idea that our attitudes tend to derive from past actions and context, and less so from deep unconscious preferences. What we have done has an outsized influence on what we will do. This likely accounts for the success of influence techniques like *foot-in-the-door,* which initially request a small compliance in the hopes of gaining a larger compliance in the future (Cialdini, 1996).

Where possible, it is almost always helpful to make timely cues available externally as well. Having to move the object you intend to take with you out of your path as you leave the house improves the odds that you will remember it. As our bodies stumble over physical objects, our eyes also stumble over visual objects. Psychologists have long studied visual *pop-out effects*, in which items that are sufficiently different from their surroundings capture attention automatically (Treisman & Gelade, 1980). Faces appear to have a pop out effect of their own (Hershler & Hochstein, 2005), which may account for the effectiveness of 'watching eyes' in promoting pro-social behavior (for a recent meta-analysis see Dear, Dutton, & Fox, 2019).

Social

Social comparisons influence a variety of human behaviors including alcohol consumption, diet, crime, and well-being (e.g., Boyce, Brown, & Moore, 2010). Social cues are especially effective because they tend to have primacy in cognitive processing (Fiske et al., 2006; Hills, 2019). When cues come from our ingroup (people like ourselves or representative of our authorities), we not only pay attention to them, we often see value in complying with them (Buunk & Gibbons, 2007).

All of Cialdini's six influence techniques are social. *Scarcity* signals the preferences of others ("Only one room left"). *Reciprocity* creates an obligation to another, which we feel motivated to repay. *Social proof* signals a social norm ("This is what most people do") and establishes a *logic of appropriateness* which can be used in negotiation as well (Malhotra, 2016). *Commitment* is based on the idea that we judge our own behavior partly through what we believe other people expect us to do ("In the past you chose X"). *Authority* and *Liking* are both implicitly social cues. The EAST framework conveniently summarizes this in one word: 'social' (Halpern, 2004).

Economists have also demonstrated the impact of social cues in a variety of settings, including energy usage (Alcott, 2011), charitable giving (Frey & Meier, 2004), voting (Gerber & Rogers, 2009), and employee effort (Bandierra, Iwan, & Imran, 2006). The commitment of military soldiers is often brought about through social commitments to their

fellow soldiers more so than through commitments to shared ideology (Bregman, 2020). Similarly, social cues designed to elicit emotions are often stronger when they refer to specific individuals as opposed to statistical aggregates or unidentifiable victims (*psychic numbing* and *the identifiable victim effect*, respectively; Bhatia, Walasek, Slovic, & Kunreuther, 2020; Jenni & Loewenstein, 1997)

One of the strongest and most undervalued social cues is a good face-to-face question. People routinely overestimate the number of people they will need to ask to get a 'yes' (Flynn & Lake, 2008). There are many potential reasons for this, including the awkward social cost of saying 'no' to a direct request (Newark, Flynn, & Bohns, 2014). Face-to-face questions also guarantee the attention of the target, personalize the request, and prevent the target from remaining anonymous with their answer.

Identity

Personalized information captures attention (Cunningham & Turk, 2017). We are interested in things that are directly related to ourselves, sometimes called *self-processing biases*. Cues that mention our names, show pictures of us, or otherwise let us know that we are the target are more likely to be attended to as well.

MINDSPACE's ego (E) speaks directly to this. Following Carnegie's (1936) claim that "a person's name is to that person the sweetest and most important sound in any language" (p. 83), numerous studies have shown that our name and names similar to our name not only capture our attention but increase our liking of people using those names (Garner, 2005).

Our attention is also captured by things we associate with our own identity, such as our interests or things we own. Halpern (2014) describes the added effect of a hand-written name or showing people pictures of their own cars when requesting payments. The increase in personal data is further facilitating technologies that can use that data to create effective personalized persuasion (Kaptein, Markopoulus, De Ruyter, & Aarts, 2015).

Behavior

In the last chapter of Christian and Griffiths (2016) *Algorithms to Live By,* they put forward a take-home lesson from their book which they call *computational kindness.* The less effortful thinking a task requires and the less of a burden it puts on the individual to do it, the more likely it is to get done. "Can we meet next Thursday at 11am" is an easier question to answer than "Let me know when you're free to meet." The simple logic behind this lesson is that behaviors that involve a series of steps are more effortful to complete and therefore more susceptible to interruption.

All other things being equal, the easier a behavior is to do, the more likely it is to be done. This is summed up nicely in EAST's 'Easy'. That ease is achieved through simplification, reducing the number of steps involved and the barriers to achieving it, making it clear what should be done and providing information in a format that makes it easy to evaluate.

Friction

Barriers to behaviors are forms of *friction*. Even when people intend to perform incredibly costly behaviors a little friction can make a huge difference to whether or not it gets done. Suicides in England and Wales declined by more than 1000 people per year, approximately 35%, between 1963 to 1975, primarily because carbon monoxide was removed from the public gas supply, and therefore from people's ovens (Clarke & Mayhew, 1988). As the authors note, "Few of those prevented from using gas appear to have found some other way of killing themselves" (p. 79). This apparent impulsiveness is found time and again. In the United States, where gun suicides account for approximately 50% of all suicides, states that introduced more restrictive gun control laws saw reductions in suicides that rose again after those restrictions were removed (Boyd, 1983). Nor is this impulsiveness restricted to suicide. Recall the fall in Texas motorcycle theft mentioned earlier. In sum, to reduce behavior, increase the friction.

On the flip side, to increase behavior, remove the friction. The most likely behaviors are behaviors that will happen even without input from the people doing them. Attention is not necessary if the behavior is going to happen anyway. This is the strength of *defaults* and *automatic enrolment*. When a form is already filled out, a box already ticked, or a contract printed on formal letterhead, people have a strong tendency to leave it as it is (Jachimowicz, Duncan, Weber, Johnson, 2019; Cribb & Emmerson, 2020). As a result, we can also remove friction by helping people fill out forms for services after they choose them. Pre-filled out university financial aid forms for low-income families increased applications for financial aid by 40% and university enrollment by 29% (Bettinger, Long, Oreopoulos, and Sanbonmatsu, 2012). Indeed, Sunstein (2019) argues that *sludge audits*, designed to remove friction from public and private institutions, should become standard organizational practice as billions of dollars are wasted each year wading through administrative sludge.

Behaviors that can be reduced to single steps are especially effective. A large-scale study on the UKs HMRC tax forms found that making something a single click on an online form led to a 22% increase in completion (Halpern, 2014). Moreover, if this one-step behavior is signaled at the appropriate time—so that remembering to do it does not become an additional step—friction is incredibly low. Friction and its absence can be combined to create remarkable consequences. The rise of online misinformation is a result of the (high friction) difficulty of evaluating online content combined with the (low friction) ease with which one can share it (Menzer & Hills, 2020).

Clarity

As desired behaviors become more complex, the importance of clearly communicating what should be done and the information necessary to do it rises dramatically. Consider complex behaviors such as living a healthy lifestyle, supporting human or animal rights, or 'fighting climate change'. Communication about these issues often sits too far above behavior to be effective, leaving people feeling helpless and frustrated (e.g., Clayton & Karazsia, 2020). Climate change information is everywhere, and many people admit to being deeply concerned about it. However, studies consistently show that people overestimate the impact of things like littering on climate change, while underestimating the impact of their own diet (Bose, Hills, & Sgroi, 2020; Truelove & Parks, 2012).

To overcome this, communication about what is to be done needs to be clear. In the behavioral literature, knowing what to do and believing that one can do it is called *efficacy*. By telling individuals what to do about climate change and how it mattered, researchers were

able to overcome climate change helplessness and produce lasting behavioral effects (Salamon, Preston, & Tannenbaum, 2017). In general, the more complex the behavior, the more communicators must attend to communicating it clearly, breaking it down into tangible and manageable actions.

Another way to describe clarity is in terms of amount of information: Less is often more when it comes to influencing behavior. Halpern (2014) describes communication strategies tested by the UK's Behavioural Insights Team, which found that "tax letters written in plain English, with a clear, simple request *at the beginning* [italics added], could often be 200-300 per cent more effective than the originals we compared them with." After capturing attention, communicate what to do. Halpern (2014) provided similar examples of increased effectiveness for decluttered emails and webpages, which make actions clear, and remove superfluous and distracting details.

Control

More complex and effortful behaviors require that communicators take special care. Kahneman's (2011) *Thinking Fast and Slow* describes two cognitive extremes. One extreme, called System 1, is fast and operates automatically and involuntarily, with little or no effort. The other, System 2, is slow and operates effortfully, requires concentration, and is easily distracted. The performance of novel or unpracticed behaviors that require thoughtfulness and deliberation require System 2 processes. This means they easily suffer from distraction. Moreover, they also require stronger motivation (Ouellette & Wood, 1998; Lally & Gardner, 2013). When additional tasks are added to cognitively effortful tasks performance suffers.

Automatic versus effortful thinking also corresponds with long-standing theories of attitude formation and response to persuasive information. Petty and Cacioppo's (1981) *Elaboration Likelihood Model* (ELM) describes *central* and *peripheral* pathways to persuasion. The central pathway engages with System 2 thinking, is slow and deliberative, and responds to reasoned arguments. The peripheral pathway engages with System 1 thinking, is fast and automatic, and often involves cognitive short cuts. Similarly, Chaiken's (1980) *Heuristic-Systematic Model of Information Processing* argues for *heuristic* (fast, System 1) and *systematic* (slow, System 2) processing. One corollary of this division is that when people are more concerned and have more time, they will engage central, systematic, and System 2 processes.

There are two key take-aways from thinking about behavior as the outcome of fast and slow processes. The first reiterates the point of computational kindness: by reducing behavioral complexity and effortful thinking, we increase the likelihood that attentional capture leads to behavior completion—less effort means more completion. The second is that complex and novel behaviors require effortful cognitive processes (System 2), and to the extent that they require effort they are more susceptible to distraction.

Effortful tasks can become automatic through repetition (like reading and driving; Schneider & Shiffrin, 1977). This is often good, but sometimes bad. For example, Christian and Griffiths (2016) describe 'training scars' in police forces that overlearn specific actions, such as disarming an assailant and then returning the weapon to the assailant just as they have done thousands of times during training.

Developing good habits benefits from repetition, stable contexts, and reward schedules that help to internalize incentives (Lally & Gardner, 2013). Alternatively, overcoming unwanted habits benefits from effortful self-monitoring, implementation intentions that engage effortful processes by activating pre-planned alternative responses ('substitution'), and removing or avoiding the cues that initiate the behavior (Wood & Runger, 2016). Also effective are *commitment devices*. These help align short-term and long-term preferences, such as agreeing to present something to others at a meeting on a certain date or signing a financial contract, even with oneself, such as on websites like StickK. There are, of course, more extreme commitment devices, which include tying oneself to the mast to prevent engaging with unwanted social partners (Odysseus and the Sirens) or visibly throwing the steering wheel out of one's car in order to commit oneself to winning a game of chicken, or to die trying (Schelling, 1960).

Boosting is an approach to behavioral influence that focuses on enhancing control developing competencies (Hertwig & Grüne-Yanoff, 2017). Boosts are in contrast to *nudges,* which are often non-educative and aimed at guiding behavior towards particular choices without awareness (Thaler & Sunstein, 2009). Most of the methods described in this chapter fall into the category of nudges. Boosts, on the other hand, are designed to help people better exercise their own agency and control. Boosts include helping people control their environment by reducing distraction and temptation, helping people develop risk, financial, and digital literacy, and helping communicators provide information in formats that facilitate effective decision making (Kozyreva, Lewandowsky, & Hertwig, 2020). In essence, boosting enhances control by reducing friction at the level of how people process information.

Consequences

Consequences are what the behavior accomplishes. If attention is appropriately captured and people know how and what to do, all that may be lacking is the compulsion of the consequences. Halpern (2014) describes how warning debtors with a text message that a bailiff would soon show up at their door led many to quickly pay their debt. In this case, the mechanism that captures attention is also a reminder of the consequences of further failures to act. Consequences can be strategically highlighted or hidden. Taxes that are incorporated into the advertised price of products, as opposed to at the till, reduce demand for those products (Chetty, Looney, & Kroft, 2009). In this section I focus on the vividness with which consequences are communicated, the frequency with which they occur, and finally the way they are framed.

Concreteness

Not all consequences are easy to communicate or experience. The is especially true for cases with low probability events or where cumulative effects are small. Marshall (2015) points out that one of the biggest psychological problems facing many forms of collective action is the inability of the individual to see the impact of their own behavior. It is a fundamental axiom of basic behavioral research that timely feedback is essential for guiding and reinforcing behavior. However, in the case of problems like climate change, health decisions, and proliferation of misinformation, the consequences of a single decision are often difficult to detect. It is therefore easy to develop false beliefs or be deliberately misinformed. Revealing the true consequences of one's behavior in a way that empowers people to behave differently is an ongoing challenge (Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012; Lorenz-Spreen, Lewandowsky, Sunstein, & Hertwig, 2020).

Efficacy salience is an approach designed to transform the consequences of behavior into tangible and easily visualized quantity. This can be an effective way to make abstract consequences more concrete, such as indicating how the CO_2-equivalents of a typical meal of red meat are equivalent to 25 miles driven in an average car (e.g., Bose, Hills, & Sgroi, 2020). Aronson (1990) labelled this effect *vividness*. In one experiment, he had salespersons claim that the failure to insulate around the cracks in the doors of a home were equivalent to poking "a hole the size of a basketball in your living room wall." Effective altruism attempts to increase altruistic behavior using vividness, for example, by computing the consequences of charitable giving in terms of its impact on the recipients' quality adjusted life years (QALYs) or computing the impact of a single vote in terms of the expected value of turning an election (MacAskill, 2015).

Boosting also helps people to better evaluate the consequences of their own behavior (see Hoffrage, Lindsey, Hertwig, & Gigerenzer, 2000). For example, numerous studies have demonstrated that the use of natural frequencies ("2 out of 1000") is far better than percentages (".2%") at helping people to make correct inferences. Percentages often blur the lines between absolute and relative increases in risk and make it harder for people to compare alternative behaviors. Consider the difference between writing "Power lines increase childhood cancer by 100%", versus "Power lines increase childhood cancer from 1 in 10 million to 2 in 10 million."

Similarly, products can also be labelled with more concrete information. For example, if people are hoping to compute the relative improvement of choosing a vehicle that gets better mileage, communicating vehicle mileage using liters-per-100-kilometers (L/100km) is more meaningful than miles-per-gallon (mpg). The relative cost increase of 1 L/100km is always the same, whereas the cost of 1 mpg differs depending on whether it is added to 10, 20 or 30 mpg (Larrick & Soll, 2008). Scholars continue to provide evidence and arguments for more effective communication and product labelling on, for example, food, drink, appliances, and even activities such as gambling (e.g., Newall, Walasek, Hassanniakalager, Ludvig, & Browne, 2020). Effective labelling could provide a dashboard of information, including such things as "lifetime product costs" and "reduction in quality adjusted life years."

Variability

Though financial incentivies have a checkered past, they can be effective (Gneezy, Meier, & Rey-Biel, 2011). In a randomized control trail that paid some participants for quitting smoking, the offer of payment led to more individuals signing up and a larger proportion of those individuals completing the smoking-cessation program (Volpp et al, 2009). In another study, students incentivized based on their inputs to education (e.g., reading books) performed better than students incentivized based on outputs (test scores), the latter group performing no better than unincentivized groups (Allan & Fryer, 2011). Paying people money to behave, however, can be expensive. And paying people small amounts, as noted in the introduction, can be counter-productive.

A promising alternative is to use *lotteries*. These make individuals eligible to win large and desirable rewards given appropriate behavioral outcomes. A large field study in Lesotho found that financial lotteries were effective at reducing unsafe sex and, consequentially, the transmission of HIV and other sexually transmitted diseases (Björkman Nyqvist, Corno, De Walque, & Svensson, 2018). Lottery schemes can also increase purchasing via price

promotions more so than fixed price promotions (compare "1% chance it's free" to "1% off"; Lee, Morewedge, Hochman, & Ariely, 2019). For longer duration tasks, lottery schemes can be made more effective by allowing people to earn tickets to a single larger lottery, thus preventing individuals who fall behind from becoming disincentivized (e.g., Camilleri, Danková, Ortiz Gomez, & Neelim, 2020).

Some of the most effective forms of probabilistic incentives are *variable reinforcement schedules*. These come in the form of variable interval schedules, which pay out after varying intervals of time, and variable ratio schedules, which pay out after variable numbers of responses. Variable reinforcement schedules promote more responses than fixed reinforcement schedules. They also maintain responses for longer after rewards have been removed (Ferster & Skinner, 1957). Online environments are replete with variable schedules—including emails, social media 'likes', and Breaking News events—which can lead to persistent and automatic 'checking' behavior (Kozyreva, Lewandowsky, & Hertwig, 2020).

Framing

Consequences almost always occur in relation to one or more alternatives. Often those alternatives can be *framed* so that people are led to make one comparison instead of another. For example, alternatives can be presented in terms of gains ("90% survive") or losses ("10% die"), which can in fact both be true. Most of us prefer our food to be 90% fat free as opposed to 10% fat, which may contribute to the futility of many efforts to diet. Levin and colleagues (1998) review a substantial body of research indicating the impacts of such framing.

One standard approach to framing highlights gains or losses in relation to risky alternatives, where some alternatives are certain (Out of 600 people: "200 people die" or "400 people live") and others are risky ("a one-third chance that 600 people will die" or "a two-thirds chance that 600 people will live"). Loss framing ("people die") leads more people to favor risky outcomes (Kahneman & Tversky, 1991). The tendency to see a loss as larger than an equivalent gain is called *loss aversion.* Other kinds of framing can focus on long-term or short-term outcomes ("$200 cash back when you buy a car" vs. "$2000 additional payment over the lifetime of the car loan"; Wulff, Hills, & Hertwig, 2015).

Mental accounting is the act of valuing the same amount differently depending on some arbitrary reference point, and it leads us to do silly things like driving across town to save $10 on a $20 product ("It's 50% cheaper!") but being perfectly happy to avoid the same drive to save $50 on a $5000 car ("It's only a 1% savings."; Thaler, 1999). In all of the above cases, it is the tendency to evaluate consequences relative to one of many reference points of comparison (often chosen by the someone else) that puts people off balance. Comparing an average car to a poor-quality but equally expensive alternative makes the average car look better. Let your neighbor buy an even nicer car, and suddenly it looks worse.

Conclusions

The ABCs are a lens through which to view approaches to behavioral influence. The ABCs— attention, behavior, and consequences—are not exhaustive, but they hopefully help us to ask some of the right questions: what initiated a behavior, why was one action taken and not another, why are some actions started but not completed, and how can we frame

consequences to better motivate the actions we want to see. As a lens, the ABCs offer some guidance towards organizing existing frameworks and knowing what to look for in new approaches.

For example, the EAST framework focuses on making behavior *easy* and on capturing attention with *attractive* and *timely* stimuli. It harnesses attention capturing *social* cues, which also model behavior and highlight social consequences. Similarly, the nudge approach of Thaler & Sunstein (2009) might be said to focus on all of the ABCs, but also aims to be "cheap and easy to avoid" while often focusing on peripheral, System 1, and heuristic pathways. Boosting, on the other hand, can be said to focus on all of the ABCs as well, while focusing mainly on reducing effortful processing by central pathways and therefore helping people identify and develop their own attention capturing cues, choose and complete desired behaviors, and evaluate the consequences of those behaviors relative to their own aspirations.

There are many more strategies and techniques than could be outlined here, but the majority of them will fall under the lens of ABC (e.g., Cialdini, 2016; Duckworth & Gross, 2020; Hallsworth & Kirkman, 2020). None of these strategies will work in every situation, though most are supported by the weight of the evidence, including meta-analyses that combine research from numerous studies. Where possible, they should all be treated with the experimental respect they deserve. It has become commonplace in industry to A/B test new initiatives, pitting various alternatives against one another to identify what works better. Advances in statistical methods also make it possible to evaluate initiatives as they roll-out across different communities (e.g., stepped-wedge design).

The ABCs accept that human behavior is complex. Nonetheless, in a nutshell, behavior starts, it happens, and then it ends. Thus, finding ways to trigger it, helping it to happen, and making the ending worthwhile are a good rule of thumb. The many factors that influence how to do those things could fill volumes. Data science can certainly help identify where these factors are influential, but they are more likely to be successful when informed by strong behavioral intuitions about where to look.

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