



THE SCIENCE BEHIND THE **MORE** DESIGN

Reference on behavior change models and psychological science/behavioral economics factors.

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Steve Vernon, FSA
Research Scholar
Stanford Center on Longevity
svernon@stanford.edu

Elizabeth Borges
Research Assistant
Stanford Center on Longevity



**STANFORD
CENTER ON
LONGEVITY**

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INTRODUCTION

The MORE Design organizes various findings from psychological science and behavioral economics for use by human resource and finance practitioners when designing and communicating retirement and employee benefit plans. The MORE Design is not intended to be another theoretical model that describes behavior change and decision-making. Rather, it is a construct that will help practitioners use psychological science and behavior economics to engineer better outcomes with retirement and benefits programs.

As an analogy, engineers integrate various principles from the sciences, such as physics and chemistry, to build automobiles and other manufactured products. Our aim is to synthesize empirical evidence about behavior for practitioners so they can improve the financial well-being and health of employees, members and customers. Our primary goal is to provide guidance for employers, non-profit organizations, consultants, advisers and businesses when designing retirement and benefits programs that require behavior change and decision-making.

The MORE Design identifies four steps that underlie successful behavior change and decision-making:

STAGE 1 Motivate. Make people aware of the need for change, and motivate them to make a change.

STAGE 2 Optimize. Assist and encourage people to gather facts, learn strategies, study options and help build decision-making capabilities.

STAGE 3 Realize. Support people in making and implementing a decision.

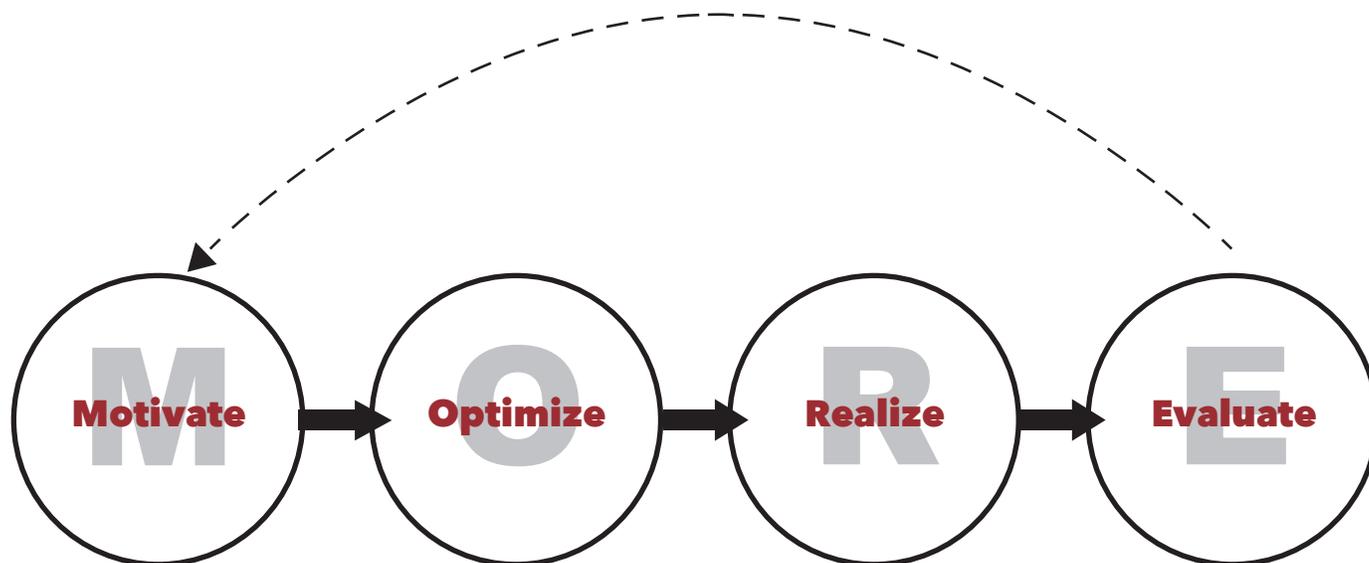
STAGE 4 Evaluate. Help monitor progress, and make adjustments if necessary.

For more details on the MORE Design, see the paper titled *The MORE Design: Integrating Behavioral Economics and Psychological Science to Engineer Better Outcomes with Human Resource, Benefits and Retirement Programs*.

This paper is a companion to the above paper and serves as a reference for practitioners to learn more about the research and science that supports the MORE Design. It has the following two sections:

- **Section I:** Description of four behavior change/decision-making models that have been developed by prominent social scientists. The MORE Design integrates features from these models for use by designers.
- **Section II:** Reference list of behavioral economic and psychological science factors. This list describes the principles that are most relevant to designing human resource, benefits and retirement programs. It is not intended to be an exhaustive list of behavioral economics or psychological science factors. This list is organized in alphabetical order and does not discuss the relative importance of each factor. The MORE Design paper identifies factors that may be most relevant to each stage.

This paper ends with a list of citations that are referenced in this paper and in *The MORE Design*.



STAGE 1

Make people aware of the need for change, and motivate them to make a change.

STAGE 2

Assist and encourage people to gather facts, learn strategies, study options and help build decision-making capabilities.

STAGE 3

Support people in making and implementing a decision.

STAGE 4

Help monitor progress, and make adjustments if necessary.

SECTION I: BEHAVIOR CHANGE AND DECISION-MAKING MODELS

A. PROCHASKA'S STAGES OF CHANGE MODEL

The Stages of Change Model, developed by psychologist James Prochaska, is one of the most well-known models of behavior change. Although initially devised to create psychotherapeutic interventions for people struggling with addiction, it is applicable more broadly to any kind of behavior that is difficult to change. According to this model, behavior change occurs in five distinct stages:

1. **Precontemplation.** In this stage, people have no serious desire or intention to change their behavior. In many cases, people may not even be aware that the behavior is a problem, although others may think so and may try to convince them to change.
2. **Contemplation.** People enter this stage when they acknowledge that they need to change their behavior and begin to seriously consider how to do so. However, people have not yet made a serious commitment to change; they are still weighing the pros and cons of the problem against the pros and cons of the solution.
3. **Preparation.** In this stage, individuals are very close to changing their behavior and will likely undertake action within the next month. They have begun to lay the groundwork for change by considering a plan of action.
4. **Action.** Individuals enter this stage when they begin to actively work on changing their behavior, either by modifying their experiences, their environment or the behavior itself. Given how difficult it is to overcome inertia and change long-held patterns, this stage generally takes a lot of time and energy.
5. **Maintenance.** After people have successfully changed their behavior, they enter this stage to solidify the change and ensure that they won't return to the old behavior.

Though some people move through these stages linearly, others may relapse and regress to an earlier stage, moving from preparation back to contemplation, for example. Successful behavior change occurs when a person progresses all the way to the maintenance stage and then remains there (Prochaska, DiClemente, and Norcross, 1992).

To move from one stage to the next, people must have awareness of the problem, confidence in their ability to solve the problem and specific strategies to change the problem. Therefore, the Stages of Change Model suggests that behavior change can be facilitated by increasing a person's awareness and/or confidence, or by identifying and promoting specific strategies to help a person move from one stage to another.

B. SOCIAL COGNITIVE THEORY

Noted psychologist Albert Bandura created Social Cognitive Theory to explain how people change and develop over the course of their lives. At its core is a concept known as "triadic reciprocal determinism," or the idea that behavior, personal factors (including cognition and affect) and the environment all influence each other bi-directionally. Behavior, for example, can influence one's cognition, which can influence how one interprets the environment, which can in turn affect one's behavior. People both shape and are shaped by their environment (Bandura, 1989).

This model contributes to our understanding of behavior change by explaining the process by which people learn new behaviors. According to Bandura, learning occurs through observation and subsequent modeling of the behaviors performed by one's peers. (Bandura called this process "social learning theory.") There are four substages of learning a new behavior:

1. **Attention.** Individuals must first notice and pay attention to the behavior. Some behaviors attract more attention than others, depending on situational factors and/or personal characteristics.
2. **Retention.** After observing a behavior, people must take this information and convert it into rules and patterns to be stored in memory.
3. **Reproduction.** Individuals take these rules and patterns and translate them into action. It may take several attempts for people to produce a behavior that appropriately matches the concepts they have stored in memory.
4. **Reinforcement/Motivation.** When a new behavior is met with positive reinforcement (by leading to a desired outcome or soliciting positive feedback from peers, for example), the behavior becomes part of a person's regular performance.

The success of this learning process depends on three important factors: behavioral capability, forethought and self-efficacy. First, people must have the ability and/or skills to perform the given behavior. Second, individuals must exercise forethought and anticipate that the given behavior will have a desired outcome. This motivates them to engage and continue in the learning process. Finally, people must display high self-efficacy, or the belief that they have control over the given behavior. Judgments of self-efficacy result from people's appraisal of their own skills and abilities within a given domain, as well as their perception of situational factors that might help or hinder a particular behavior (Bandura, 1989).

C. AJZEN'S THEORY OF PLANNED BEHAVIOR

The Theory of Planned Behavior, developed by Icek Ajzen, draws a strong connection between intention and action. According to Ajzen, behavior change depends significantly on the strength of a person's behavioral intention. This concept describes a person's readiness to perform a given behavior: how motivated people are, how hard they will try and how much effort they will expend.

When people's behavioral intentions are strong, they're likely to change their behavior; when people's behavioral intentions are weak, they're unlikely to change their behavior. Ajzen notes that this theory applies only when people actually have the ability to perform the given behavior; in cases where they lack the necessary opportunities and resources to perform a particular behavior, their behavioral intention may not align with their subsequent actions (Ajzen, 1991).

Behavioral intentions result from three sets of beliefs:

1. **Behavioral belief.** Behavioral beliefs are the beliefs that people hold about the consequences of a given behavior. If they think the outcome will be favorable, then they're likely to develop a positive attitude toward the behavior; if they think the outcome will be unfavorable, then they're likely to develop a negative attitude toward the behavior.
2. **Normative belief.** Normative beliefs describe how people feel they should behave in a particular situation. They result from a person's assessment of the subjective norms regarding a given behavior—that is, how a person feels social pressure to behave.
3. **Control belief.** This belief serves as the basis for people's perceived behavioral control, or the level of confidence they have in their ability to change their behavior. Control beliefs are shaped in part by personal factors (a person's skill set and ability level) and in part by environmental factors (the presence or absence of situational factors that facilitate or impede behavior change). When control beliefs are high, people feel empowered to change their behavior; when control beliefs are low, people have little confidence in their ability to change.

Consequently, individuals will have strong behavioral intentions and perform a given behavior when they hold positive attitudes towards the behavior (behavioral beliefs), believe that the behavior is socially acceptable (normative beliefs), and have confidence in their ability to perform the behavior (control beliefs).

D. HEATH'S BEHAVIOR CHANGE FRAMEWORK

In their bestselling book, *Switch: How to Change Things When Change Is Hard*, brothers Chip and Dan Heath argue that behavior results from an interaction between two independent systems in a person's brain: the rational side and the emotional side.

Borrowing language from Jonathan Haidt's *The Happiness Hypothesis*, the Heaths call the rational side the "rider" and dub the emotional side the "elephant." The rider thinks long-term while the elephant is more concerned with instant gratification. Although most people believe that the rider has all the control, they contend that our rational side is often overpowered by the emotional side—the instinctive, large, blundering elephant. As a result, when the rider and the elephant have different desires, it can be hard for people to carry out behaviors that require patience and willpower (like sticking to a diet).

Using this framework, the Heaths identify three potential ways to shape behavior:

1. **Direct the rider.** The Heaths maintain that people often resist behavior change due to a lack of clarity; if people don't know exactly what to do, they'll stick with what they already know (the status quo). Therefore, it's important to provide people with crystal-clear direction about the desired behavior, which helps the rider take control. Telling people to drink 1 percent milk instead of whole milk, for example, is a lot more effective than simply telling them to eat healthier.
2. **Motivate the elephant.** The Heaths argue that inertia results from exhaustion rather than laziness: People who abandon behavior change have likely consumed their mental resources by trying to rein in their emotional side. To address this problem, it's important to engage people's emotional side, thereby turning the elephant into an asset rather than a hindrance.
3. **Shape the path.** The Heaths contend that environmental and situational factors often play a large role in guiding behavior.

Research shows that the size of the popcorn container, for example, influences how much popcorn people consume; people eat more popcorn when the container is large than they do when it is small. Consequently, changing a person's surrounding environment can facilitate behavior change.

Only one of these interventions is necessary to facilitate behavior change, though the Heaths argue that implementing all three provides the best chance for dramatic behavior change.

SECTION II: REFERENCE LIST OF PSYCHOLOGICAL SCIENCE AND BEHAVIORAL ECONOMICS FACTORS

AFFECT HEURISTIC

Definition: The affect heuristic describes the tendency to base a decision on the feelings of positive or negative emotion (i.e., the impressions of “badness” or “goodness”) that are rapidly and automatically associated with a stimulus. Robert Zajonc first proposed this idea in 1980 when he argued that our initial reactions to a stimulus are often affective in nature and that these emotions influence how we process the stimulus. From an evolutionary standpoint, this emotional “valence” (or directionality) of a stimulus can serve as a shorthand for whether we should respond with behaviors associated with approach or avoidance (Knutson et al., 2014). Subsequent studies have confirmed that our mental representations of a stimulus appear to be “tagged” with positive or negative emotions that guide our decision-making, particularly in decisions about risk. For example, people are more likely to perceive an activity as low risk if it activates feelings of liking and as high risk if it activates feelings of dislike (Slovic et al., 2007).

Research example: Participants in a study were given a set of Chinese characters and told to memorize their English meanings; half of the characters had positive meanings, and half had negative meanings. Participants were quizzed on the meanings, then presented with pairs of characters and asked which character they preferred. Not surprisingly, participants preferred the character with the positive meaning about 70 percent of the time. Then participants were told that all the characters actually had neutral meanings (such as “table” and “chair”) and were instructed to memorize the new meanings. Participants were again presented with pairs of characters and asked to choose which character they preferred. Even though participants had learned the actual neutral meanings of the characters, they still preferred the characters that had previously been given positive meanings. That’s because the characters had been “tagged” with positive or negative valence in the participants’ minds, and this association was difficult to remove even after participants learned the true meanings of the words (Sherman and Kim, 2002).

Real-world application: Many people have strong positive or negative associations with the word “retirement” and associated concepts like “annuity,” “stock market” and “financial adviser.” The emotional associations with these concepts may determine an individual’s willingness to actively plan for retirement. For instance, people who have positive associations with retirement may look favorably on retirement savings plans and consider them to be a practical and safe investment, while people who have negative associations with retirement may perceive savings plans as unnecessary or higher risk. Similarly, positive associations with the stock market may prompt individuals to invest their money, while negative associations with the stock market may create reluctance and disengagement.

ANCHORING EFFECT

Definition: Anchoring effects occur when a person consciously or unconsciously estimates a number that is based on adjustments from a starting value (the “anchor”). Typically, people do not adjust sufficiently upwards or downwards from the anchor, leading to an estimate that’s biased towards the anchor (Tversky and Kahneman, 1974). This is especially problematic as arbitrary or incidental numbers that are unrelated to the task at hand can become anchors when individuals are determining estimates.

Research example: Study participants were recruited to estimate the percentage of African countries in the United Nations (UN). Before subjects submitted their estimates, the experimenters spun a wheel of fortune, which landed on a number between one and 100. The experimenters asked participants to indicate whether the percentage of African countries in the UN was higher or lower than this random number. After answering this question, participants then

generated their estimates. Due to anchoring effects, the starting value produced by the wheel of fortune was shown to have influenced participants' estimates. For instance, when the wheel of fortune spun a 10, the median estimate was 25. In contrast, when the wheel of fortune spun a 65, the median estimate was 45. Participants "anchored" their estimates to the number produced by the wheel of fortune, even though this had absolutely no relationship to the percentage of African countries in the UN (Tversky and Kahneman, 1974).

Real-world application: When a person decides how much to contribute to a defined contribution plan, the default contribution rate serves as the anchor. Since people generally make choices in the vicinity of their anchor values, people presented with a high default contribution rate will likely settle on a higher contribution rate than people presented with a low default rate. Moreover, Social Security's earliest eligibility age of 62 or its "full retirement age" of 66 serve as anchors when people are deciding when to retire. The age at which a person's parents or close friends retired can also act as an anchor for this decision.

CHOICE OVERLOAD

Definition: Choice overload occurs when a person experiences extreme difficulty in making a decision because there are so many potential options. According to psychologist Barry Schwartz, choice overload occurs because the person feels pressure to make the optimal decision but lacks the cognitive function to distinguish carefully among the many alternatives. As a result, the person often becomes indecisive and unhappy. In some cases, they become so overwhelmed that they refrain from making a decision altogether.

Research example: The experimenters in one study set up a sampling table at a supermarket. In both trials, there were 24 jams that shoppers could buy. In one trial, however, the experimenters set out samples of just six jams for shoppers to taste; in another trial, they put out samples of all 24 jams. Although the table with 24 jam samples attracted more shoppers than the table with six samples, shoppers were more likely to buy jam if there were only six kinds available for tasting: 30 percent of shoppers who approached the table with six jams bought a jar, compared with only 3 percent of shoppers who approached the table with 24 jams. The experimenters reasoned that the shoppers who were faced with 24 samples had trouble distinguishing between the many flavors and chose not to buy anything for fear of making the wrong decision. The shoppers who approached the table with six jams had an easier time deciding which one was their favorite and were more likely to buy a jar (Iyengar and Lepper, 2000).

Real-world application: Choice overload explains why some consumers become overwhelmed and indecisive when choosing an investment strategy for their defined contribution plan. The greater the number of options, the more overwhelmed consumers will be and the more likely they are to refrain from making any decision, so they end up with the default investment option. One study (Beshears et al., 2013) suggests that simplifying the choice environment in retirement plans increases enrollment by 10 to 20 percentage points. Choice overload can also occur when people must choose from a large number of payout options to generate retirement income as well as the many alternatives for medical insurance or Medicare Part D prescription drug plans in retirement.

CONFIRMATION BIAS

Definition: Confirmation bias describes the tendency to seek out and favorably weigh and recall information that supports an individual's previously held beliefs and hypotheses (Nickerson, 1998). The confirmation bias appears in several ways:

- Biased search for evidence and restriction of attention to a favored hypothesis. People are more likely to search for evidence that confirms, rather than challenges, their beliefs. This can lead people to overlook contradictory but important or compelling information. One study (Ambuehl, 2016) argues that when people are offered high incentives

to do something, they seek confirming evidence that the incited behavior is good.

- Biased interpretation of evidence. People are more likely to accept evidence that supports their beliefs while discrediting or rationalizing away evidence that contradicts those beliefs. They decide whether evidence is trustworthy based on its message, rather than by judging based on its merit. People tend to assign more weight to positive confirmatory evidence and less weight to negative non-confirming evidence.
- Seeing what one is looking for. When examining data, people sometimes see what they're expecting to see regardless of what's really there. In other words, they allow their expectations to guide their interpretation of the data. (See "illusion of control" for more information about this phenomenon.)

Research example: Participants who either supported or opposed capital punishment were presented with two academic studies. The first provided evidence that confirmed the deterrent effects of capital punishment, while the second provided evidence that disconfirmed these effects. Participants rated the study that confirmed their previously held beliefs as more convincing and more scientifically sound, demonstrating a confirmation bias (Lord, Ross, and Lepper, 1979). Similarly, in a study where individuals received word problems concerning either the efficacy of a skin rash treatment or of a gun control ban (Kahan et al., 2013), people were less accurate in determining the effect of the intervention in the politically-loaded gun control condition. Moreover, the degree to which politics polarized the accuracy of individuals' responses increased when they possessed greater mathematical abilities.

Real-world application: Confirmation bias could prevent people from realistically evaluating their anticipated financial status in retirement. People who believe they're well-prepared for retirement will be more likely to seek out and accept information that confirms this preconception rather than heed potential warning signs. In contrast, people who are exceptionally worried about having enough money in retirement may ignore indications that they're well-prepared and focus on information that confirms their fears.

CONSUMERISM AND CREDIT CARD EFFECT

Definition: Consumerism refers to the significant cultural value that contemporary American society places on material goods and spending, equating happiness and success with materialism. This makes saving increasingly difficult since it conflicts with the predominant cultural message spread by peers and advertisers. Additionally, the societal emphasis on consumerism has led to a widespread reliance on credit cards to fuel spending. Research has found that credit cards increase the probability, speed and magnitude of spending, a phenomenon dubbed the "credit card effect" (Feinberg, 1986). Consumerism and the credit card effect may not be strict behavioral economic phenomena as defined by social science researchers, but nevertheless represent phenomena that program designers might want to consider.

Research example: Participants were given a booklet of consumer items and asked how much money they would be willing to spend on each item. Participants in the experimental condition sat at a table with credit card stimuli on the upper left hand corner; the stimuli included a sign with the MasterCard logo and large and small replicas of credit cards. Participants in the control condition sat at an empty table. The results showed that participants exposed to credit card stimuli were willing to pay more for each item than the participants in the control condition. In other words, the credit card stimuli increased the amount of money that participants were willing to spend (Feinberg, 1986).

Real-world application: Consumerism dissuades people from saving money for retirement since they believe their current happiness is tied to the purchasing power they exercise. Messaging from advertisers and marketers reinforces this attitude and induces people to spend rather than save. This tendency appears to be particularly pronounced when individuals use credit cards, which facilitate increased spending. Additionally, consumerism can threaten a person's financial security in retirement: Some retirees may not be willing to reduce their spending habits even if they don't have the financial resources to sustain their current level of spending. This can lead them to deplete their retirement savings too quickly.

DISPOSITION EFFECT

Definition: The disposition effect describes the tendency for investors to sell shares that are performing well (“winners”) but to hold on to shares that are performing badly (“losers”). According to behavioral economists, people tend to sell winners but hold on to losers because they’re motivated to avoid losses, which are especially painful (see “loss aversion” for more on this topic). People are also reluctant to realize losses because it suggests that their initial judgment was incorrect and they want to avoid feeling the regret that comes with making the wrong decision. But this pattern of behavior conflicts with the normatively optimal strategy for realizing gains and losses since it means that a person will be left with many badly performing stocks (for a review, see Weber & Camerer, 1998).

Research example: The experimenters analyzed the trading records of 10,000 accounts at a large brokerage firm and found evidence to support the disposition effect: investors preferred to sell winners rather than losers. The data suggests this was not due to a desire to rebalance portfolios nor to avoid higher trading costs for low-priced stocks (Odean, 1998).

Real-world application: This bias describes a real-world phenomenon that plays out frequently among investors, including those making decisions about retirement funds.

ENDORSEMENT EFFECT

Definition: Strictly defined, the endorsement effect describes the tendency of employees to interpret the allocation of the employer’s contribution as implicit investment advice. For example, employees tend to overinvest discretionary funds in their 401(k) accounts back into company stock when the employer’s matching contribution is invested in company stock (Benartzi, 2001). More broadly defined, the endorsement effect refers to the tendency to use the decisions, or “endorsements,” of specific people to cue important retirement and other financial decisions. For example, people may use the savings rate of a sibling or peer as a signal to choose that as their own savings rate. Similarly, employees whose employer offers matching funds often interpret the match rate as the ideal saving rate. People may also use retirement savings advice and heuristics endorsed by “experts” without researching whether the expert has the appropriate credentials, knowledge or experience.

Research example: The experimenters chose participants who didn’t currently have an employer match to their defined contribution plan. The participants were asked how they would respond if their employer decided to offer a match that was required to be invested in an international stock fund. Participants could either increase their own contribution to international stocks, maintain their current contribution to international stocks or reduce their contribution to international stocks. The rational response would be to reduce one’s contribution to international stocks, as this would keep constant the total allocation to international stocks. Instead, participants’ most common response was to increase their contribution to international stocks, demonstrating an endorsement effect (Benartzi, 2001).

Real-world application: People often demonstrate the endorsement effect when deciding how to allocate investment funds, including contributions to defined benefit plans; in these instances, many people interpret the default setting established by their employer as implicit investment advice, or an endorsement. One paper (Madrian and Shea, 2001) argues that people seem to maintain the default contribution rate in 401(k) plans partially because they interpret the default as investment advice.

FRAMING EFFECT

Definition: Framing refers to the way that a problem or situation is presented. People usually evaluate outcomes with respect to a reference point, and framing establishes this reference point. Due to prospect theory and loss aversion, alternate framings of the same problem often yield different results. Generally, problems framed as a loss will inspire risk-

seeking behavior while those framed as a gain will motivate risk-averse behavior (Tversky and Kahneman, 1981).

Research example: The following situation was described to study participants: “Imagine that the United States is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people.” Then participants were asked to choose between two alternative programs to combat the disease. For half of the participants, the programs were described using the number of people who would be saved: “If Program A is adopted, 200 people will be saved; if Program B is adopted, there is a one-third probability that 600 people will be saved and a two-thirds probability that no people will be saved.” In this case, participants displayed risk-averse behavior and were more likely to choose option A; the prospect of a sure gain was more attractive than a potential gain that was slightly larger. For the other half of the participants, the programs were described using the number of people who would die: “If Program A is adopted, 400 people will die; if Program B is adopted, there is a one-third probability that nobody will die and a two-thirds probability that 600 people will die.” Under this framing, participants displayed risk-seeking behavior and were more likely to choose option B; the prospect of a sure loss was too painful to accept, so participants were willing to take a risk to try to avoid the loss. The way the options were framed (as losses or gains) influenced participants’ behavior (Tversky and Kahneman, 1981).

Real-world application: People may be more or less likely to purchase an annuity depending on how the purchase is framed—as a loss or as a gain. Some people may view an annuity as a gain because it provides them with guaranteed lifetime income; in other words, they’re “gaining” financial security for the rest of their life. These people will be more likely to buy an annuity because they don’t associate pain or loss with their purchase. Other people, however, may view an annuity as a loss because they must give up their savings in order to purchase one. These people will be less likely to purchase an annuity because they won’t want to incur the pain of this significant financial loss.

Similarly, framing could influence investors’ decisions to sell stock after a stock market crash. If they look at a significant loss in their portfolio that was caused by a stock market crash, they might be likely to panic and sell at the bottom. But if they look instead at the loss in retirement income from the crash (a much smaller number), they might not panic as much.

HYPERBOLIC DISCOUNTING

Definition: Hyperbolic discounting is a model of discounting future rewards where individuals are inconsistent in their choices across time. Standard models in economics assume that individuals discount future rewards, which means that individuals prefer to receive a good sooner rather than later. There are different models of time discounting in economics: Some models lead to time-consistent behavior (e.g. exponential discounting), and some lead to time-inconsistent behavior (e.g. hyperbolic discounting). Time consistency refers to an individual’s ability to follow through with the plans they made at a certain point in time. For example, if time-consistent people decide today to exercise tomorrow, they will carry out their plan. On the other hand, if time-inconsistent individuals decide today to exercise tomorrow, there is no guarantee that they will actually exercise tomorrow. It may well be the case that tomorrow they will change their mind and decide to work out the day after. Time-inconsistent individuals make choices today that their future self would prefer that they hadn’t made and that their future selves, in the absence of commitment devices, may well overturn.

As a result, hyperbolic discounters display impatience when faced with activities that have positive long-term rewards but large upfront costs, such as dieting, exercising and saving money. For example, they might think “I’ll deal with my retirement decision tomorrow”. Then, tomorrow comes and they may say “Well, I don’t feel like dealing with it today; I’ll postpone it to tomorrow”, and so on indefinitely. Hyperbolic discounters who recognize that they are dynamically inconsistent may decide to “precommit” to future behavior to resist temptation and maximize future utility.

Research example: Participants were recruited for a longitudinal experiment and were informed they would have to complete a number of tasks (e.g. transcription of Greek texts) over three weeks. At the beginning of week one, participants had to decide how to allocate the tasks between weeks two and three. At the beginning of week two, participants were given the possibility of revising the choice they made in week one. The researchers found that, when

choosing at the beginning of week two how much to work during week two, participants generally chose not to follow the plan they laid out in week one and to work less in week two than the week-one plan suggested (Augenblick, Niederle, and Sprenger, 2015). The time inconsistency shown by the participants is consistent with hyperbolic discounting and inconsistent with exponential discounting.

Real-world application: For most people, saving for retirement requires them to endure an upfront cost (their contribution to a defined contribution plan) in order to maximize their future utility (their financial security in retirement). Due to time-inconsistent discounting, however, some people may decide today to save more money in the future, but when the future comes, they decide again to postpone saving. If they repeat this behavior over the years, they may then arrive at their retirement years and regret that they hadn't saved more for retirement. Time-consistent discounting also influences the decision of when to claim Social Security. Some retirees claim Social Security as soon as they can with the lowest monthly benefit, forgoing Social Security's delayed retirement credits that can substantially increase their monthly income. They may later regret that they started Social Security benefits so early. For example, two surveys of recent retirees showed that 23 percent and 38 percent regretted their decision to start Social Security benefits early (Nationwide Retirement Institute, 2016; Nationwide Retirement Institute, 2014).

An interesting way to intervene may be by leveraging the salience of an individual's future self. Age-progressed renderings of one's future self can increase saving behavior (Hershfield et al., 2011), and one's sense of connectedness and similarity to one's future self is associated with saving behavior and the accrual of lifetime assets (Ersner-Hershfield et al., 2009). Taking a page from the literature, Merrill Lynch has created "Face Retirement," where visitors to their website can age-progress their own image while receiving messaging about retirement savings behavior.

ILLUSION OF CONTROL

Definition: The illusion of control describes the tendency of people to overestimate the extent to which their actions can produce a given outcome. People generally tend to expect a probability of success that's higher than objective probability would suggest. Notably, this occurs even in situations where chance, rather than skill, contributes significantly to the outcome. People are especially likely to overlook the role of chance in situations where choice, familiarity and competition are involved, as these "chance situations" mimic a "skills situation" and increase the illusion of control (Langer, 1975).

Research example: Employees in an office were approached by an experimenter and asked if they wanted to participate in an office lottery. For \$1, they would receive a football card with a player's name on it (this served as the lottery ticket) and a matching card would be placed in a cardboard carton. Participants were told that a card would be chosen at random from the carton later in the week and that the winner would receive \$50. Once participants agreed to purchase a ticket, half were allowed to choose their own football card (the choice condition), while the other half were simply handed a card by the experimenter (the no-choice condition).

The next day, the experimenter returned and told participants that an employee in another office wanted to participate in the lottery but that there were no more tickets. The experimenter asked the participants how much they would charge the other employee for their lottery ticket. Participants who chose their lottery ticket named a much higher price than participants who had simply been handed their ticket. The mean price for participants in the choice condition was \$8.67 compared to \$1.96 in the no-choice condition. Even though all participants had the same chance of winning, those in the choice condition named a higher price because they believed they had more control over the outcome of the lottery and were more likely to win; the act of choosing the lottery ticket induced a strong illusion of control (Langer, 1975).

Real-world application: Due to the illusion of control, people may be overly confident when predicting the amount of money they'll have in retirement. They may think they have more control over this amount than they actually do, given changes and fluctuations in the stock market. This bias may be heightened when people choose the investment strategy for their defined contribution plans rather than being assigned a strategy, since this choice induces a potentially

exaggerated sense of control. The illusion of control may also contribute to the public's widespread unwillingness to buy annuities, dubbed the "annuity puzzle." People may be reluctant to buy an annuity because they have unrealistic expectations of their ability to control their retirement investments and execute a sustainable withdrawal strategy, and they don't want to relinquish control of their assets, which is normally required with an annuity purchase.

INERTIA, STATUS QUO AND THE DEFAULT HEURISTIC

Definition: There are several psychological factors that describe a similar phenomenon: people's strong reluctance to change. First, people display inertia, or the tendency to maintain their beliefs or preferences once formed (Madrian and Shea, 2001). Since initiating a change takes effort, people are more likely to remain with their initial stance. Similarly, people have a strong tendency to remain at the default setting, or the status quo, in a choice context (Madrian and Shea, 2001). Due to loss aversion (see "loss aversion" for more information), the potential losses of leaving the status quo loom larger than the potential gains of the alternatives, resulting in the status quo bias (Kahneman, Knetsch, and Thaler, 1991).

Research example: Participants were told that they had inherited money from a family member and had to invest it in one of four portfolios. Participants in the status quo condition were told that a significant portion of the money was already invested in moderate-risk company A; they could choose to leave the money there or select from three other investment options, including high-risk company B. Participants in the non-status quo condition were told that a significant portion of the money was already invested in high-risk company B; they could choose to leave the money there or select from three other investment options, including moderate-risk company A. Participants in the neutral condition were simply presented with four options, including moderate-risk company A and high-risk company B, and told to choose the one they preferred. Participants were significantly more likely to invest their money in moderate-risk company A in the status quo condition (where Company A was set as the default), followed by the neutral condition (where there was no default), and non-status quo condition (where Company B was set as the default). These results indicate a strong status quo bias among participants, who showed a significant tendency to stay with the default when there was one (Samuelson and Zeckhauser, 1988).

Real-world application: Inertia, the status quo bias and the default heuristic strongly influence employee participation in defined contribution plans, including the decision to participate, the contribution rate and fund allocation. Employees tend to remain with the default setting for all three decisions. In their study of a Fortune 500 company, for example, Madrian and Shea found that participation rates in DC plans were higher for employees who joined the company under automatic enrollment than for those who joined under an "opt in" policy. Employees also tend to stay with the default in the payout phase; currently most DC plans pay lump sums, which are the default condition. There's current interest in designing payout defaults, but this is an area where more research is needed.

LOSS AVERSION

Definition: Loss aversion describes the tendency of losses to loom larger than gains and is one element of Prospect Theory (Kahneman and Tversky, 1979). According to prospect theory, losses are especially painful because the value function for losses is steeper than the value function for gains. Consequently, people are more motivated to avoid a loss of X amount than they are to realize a gain of the same amount. This aversion tends to increase as the amount increases in magnitude.

Research example: When presented with equal chances of winning and losing specified amounts, if presented with a potential loss of \$25, participants needed a potential gain of \$61 to accept the gamble. Similarly, other pairs of acceptable losses and gains with equal chances included (-\$50, \$101), (-\$100, \$202), and (-\$150, \$280) (Kahneman and Tversky, 1992). Risk aversion alone cannot explain this behavior, resulting in the need to define loss aversion.

Real-world application: Loss aversion can influence people's decision about when to claim Social Security, as delayed claiming for Social Security requires people to make a trade-off between potential future gains. Retirees can claim a benefit starting at age 62 with certainty, but if they delay claiming, then their monthly benefit will increase—an obvious financial gain. However, people who delay claiming also run the risk of dying before they have a chance to start collecting their money, which some may view as a potential “loss” of all their Social Security income. People who interpret this risk as a loss will be more likely to claim Social Security early, since they're more motivated to claim a known benefit at age 62 and forgo a potential gain if they delay the start of their benefits. They would rather avoid the potential loss of funds than to realize the gain of the monthly benefits.

OVERCONFIDENCE

Definition: Overconfidence describes the tendency of people to express more confidence and certainty in their own judgments than is actually warranted. Simply put, people aren't good at predicting their own level of accuracy, and so overconfidence shares much in common with the “illusion of control” mentioned earlier. This is due in part to cognitive biases (that is, people perform a biased search for information to support their current opinion) and motivational biases (that is, people often want a certain answer to be true and increase their level of confidence accordingly). Research suggests that overconfidence is especially pronounced for harder questions, though the data remains equivocal (Klayman et al., 1999). Research also suggests that men are more often overconfident than women, particularly when it comes to traditionally “masculine” domains, including finance. A study of common stock investments for 35,000 households between February 1991 and January 1997 found that men traded more excessively than women, presumably because they overestimated the accuracy of their information and the quality of their decision-making (Barber and Odean, 2001).

Research example: Participants were presented with 150 questions from 12 general knowledge domains. (Topics included the order of U.S. presidents and the number of visitors to American museums and galleries in a given year.) For each question, instead of providing an exact answer, participants were asked to estimate a 90 percent confidence range—that is, to provide a high number and a low number between which they believed with 90 percent certainty that the answer lay. If these confidence ranges had been accurate, participants' answers would have been correct around 90 percent of the time. But the correct answers fell inside the participants' confidence ranges only 43 percent of the time, indicating that participants were significantly overconfident in their answers (Klayman et al., 1999).

Real-world application: When choosing an investment portfolio for their retirement savings, people may demonstrate overconfidence in their own judgment and fail to seek necessary professional advice. People may also express overconfidence in their ability to manage their money in retirement. Due to this overconfidence, they may not consider the possibility that they will experience cognitive decline that might prevent them from effectively managing their money late in retirement.

PLANNING FALLACY

Definition: The planning fallacy describes individuals' tendency to underestimate how long it will take them to complete a task, even when past experiences would suggest a longer time frame. This occurs because people tend to focus on the specific factors of the current project rather than consider how long similar projects historically took (Kahneman and Tversky, 1977).

Interestingly, research has found that people tend to underestimate their own completion times but make more accurate assessments when predicting others' completion times on similar tasks. Research has also found that it's possible to reduce this bias by asking people to focus on similar past experiences and relate those experiences to the current task (Buehler, Griffin and Ross, 1994).

Research example: Approximately 100 college students were asked to identify an academic and non-academic project they intended to complete in the following week and predict the date and time they would finish the project. Participants returned the following week and reported when they had actually finished the projects; if participants had not completed the projects by this session, the experimenters followed up with them at the end of the semester. The results showed that participants vastly underestimated completion times for both the academic and non-academic projects. For academic projects, participants predicted a mean completion time of 5.8 days and the actual mean completion time was 10.7 days. For non-academic projects, participants predicted a mean completion time of 5.0 days and the actual mean completion time was 9.2 days (Buehler, Griffin and Ross, 1994).

Real-world application: As people approach retirement, they tend to underestimate the amount of time it will take to make various decisions. As a result, they might take shortcuts to get this planning done or may not leave themselves enough time to make the appropriate decisions. Some of these decisions include: when to start claiming Social Security, how to generate retirement income, where to live, whether or not to work, what medical plan to choose and strategies to address the threat of long-term care.

PROSPECT THEORY

Definition: Developed by psychologists Daniel Kahneman and Amos Tversky, prospect theory provides a descriptive model of decision-making under conditions of uncertainty. In other words, the theory describes how people actually make decisions involving risk rather than how they would make decisions as rational actors. Kahneman and Tversky developed this model to explain patterns of individual decision-making that violate the projections of expected utility theory. The key tenets of prospect theory are:

- *Carriers of value are changes in wealth and welfare with respect to a reference point.* Prospect theory posits that individuals evaluate gambles by assessing how the possible outcome of a gamble compares to a pre-specified reference point, which is generally assumed to be the status quo.
- *Individuals are risk-averse for gains and risk-seeking for losses.* When presented with the choice between a sure gain and a larger gain that involves risk but is probable, individuals prefer the sure gain, demonstrating risk aversion. But when presented with the choice between a sure loss and a larger loss that's probable, individuals prefer the larger possible loss, demonstrating risk-seeking behavior. Since the sure loss will be very painful, individuals are motivated to take a risk to try to avoid this loss.
- *The value function for losses is steeper than the value function for gains.* Losses loom larger than gains: The perceived pain generated by losing amount "X" is greater in magnitude than the pleasure from gaining amount "X" (see "loss aversion" for more information).
- *Individuals tend to overvalue the likelihood of low probability events and undervalue the likelihood of high probability events.* This can cause individuals to adopt potentially counter-productive steps to avoid a potential loss from a low-probability event.

When evaluating the potential influence of prospect theory, it's important to identify the reference point and whether it is reasonable (see "anchoring effect").

Research example: Participants were presented with the following problem: "In addition to whatever you own, you have been given \$1,000. You are now asked to choose between: A) a 50 percent chance of winning \$1,000, or B) winning \$500." In response, participants were more likely to choose option B, preferring the sure gain over the larger potential gain. Another group of participants was presented with a slightly different problem: "In addition to whatever you own, you have been given \$2,000. You are now asked to choose between: A) a 50 percent chance of losing \$1,000, or B) losing \$500." In this version of the problem, participants were more likely to choose option A, preferring the larger potential loss over a

smaller but certain loss. In both problems, the final states were the same, but participants displayed risk-averse behavior for positive prospects and risk-seeking for negative prospects (Kahneman and Tversky, 1979).

Real-world application: Since the value function for losses is steeper than the value function for gains, many people tend to focus on the chance of dying too soon once they reach retirement rather than the possibility that they may live very long. In this instance, the loss of dying looms larger than the potential gain of living longer. In the face of this potential loss, many people demonstrate risk-seeking behavior, such as claiming Social Security early, not buying an annuity and spending their savings rapidly. This behavior poses risks for individuals who end up living a long time but have already depleted their retirement savings.

SOCIAL NORMS

Definition: There are two kinds of social norms that influence people's behavior. "Descriptive norms" describe how people typically behave. For example, when meeting each other in a professional setting, most people shake hands. Descriptive norms influence behavior by providing evidence of what constitutes an adaptive, effective action in a given situation. Studies have shown that people often take social cues from others about how to behave, even in morally neutral situations. "Injunctive norms," in contrast, describe how people ought to behave by identifying morally approved behavior. For example, people ought to be quiet when they're in a library. Injunctive norms influence behavior by communicating which actions are likely to receive social approval. Both descriptive and injunctive norms are more likely to motivate behavior when they are made salient (Cialdini, Reno and Kallgren, 1990).

Research example: An experiment by Cialdini et al. aimed to evaluate how descriptive norms influence people's tendency to litter. The experimenters observed participants as they walked through a parking lot to their car, onto which the experimenters had placed a flyer about automotive safety. Participants could dispose of the flyer by tossing it on the ground (they could litter), or they could take the flyer with them (not litter). To test the role of descriptive norms, the experimenters varied the condition of the parking lot. Half the participants walked through a parking lot that was full of trash (which established littering as the descriptive norm), and half the participants walked through a parking lot that contained no litter (which established not littering as the descriptive norm). The experimenters also varied norm salience: In the high-salience condition, participants walked by a confederate (paid actor) who tossed out one of the flyers; in the low-salience condition, the confederate simply walked by without littering. The experimenters found that participants were much more likely to litter when littering was the descriptive norm and that this tendency was heightened when the descriptive norm was made salient by the littering confederate. When they saw someone else litter in a dirty parking lot, participants were especially likely to act in a similar way (Cialdini, Reno and Kallgren, 1990).

Real-world application: People's retirement savings behavior can be influenced by the behavior of those around them. If someone's peers are saving for retirement, they are likely to conclude that this behavior is typical and will act accordingly. In contrast, if their peers aren't saving for retirement, they will likely assume that this behavior is normal and will also fail to save. This can pose significant challenges for encouraging people to save; if they don't see others saving, then they'll be less likely to do so. Social norms can also serve as a powerful influence when a person is deciding when to claim Social Security benefits. People are more likely to claim them when they see their peers doing so as well, even though the age at which their peers claim benefits may not be optimal in their particular circumstances.

SERIAL POSITION EFFECT

Definition: When a person is learning new information, the order in which the information is presented has a strong influence on recall accuracy; this is called the "serial position effect." Specifically, people are more likely to remember the first items presented (the "primacy effect") and the most recent items presented (the "recency effect"; for a review, see

Howard & Kahana, 1999).

Research example: To test the effect of serial position on word recall, participants were divided into six conditions, each with a different combination of list length (10 to 40 words) and time between each word (one to two seconds). Experimenters read the list of words aloud, then asked participants to write down as many words as they remembered. Across all six conditions, participants showed a tendency to better remember the first words presented and the most recent words presented (Murdock, 1962).

Real-world application: When choosing an investment strategy for a DC plan, people may be more likely to choose the options at the beginning of the list (due to the primacy effect) or the options at the end of the list (due to the recency effect).

STORIES

Definition: People respond differently to information that's communicated through a story instead of through facts and figures. Research has found that people are more likely to remember stories than they are to recall statistics. As a result, stories are more persuasive and often lead to more significant behavior change (Aaker, 2013). There are four elements of successful stories:

- *They have a goal.* There's a clear goal for what the audience should think, feel or do at the end the story. The story aims to change the audience in a specific, discernible way.
- *They grab people's attention from the outset.* The story uses a "hook" to draw the audience in, and people want to hear the story.
- *They keep the audience engaged.* The story uses a thoughtful narrative structure with a compelling protagonist, clear goal and engaging plotline.
- *They enable the audience to share the story.* The story inspires the audience to share its message with others and provides a clear, straightforward way to do so.

Research example: Participants were asked to complete a survey on technological products in exchange for \$5. (The survey was actually irrelevant to the actual experiment.) After the survey, participants received information about Save the Children, a charity that provides food to poor children in southern Africa and Ethiopia, and they had the chance to donate some of their payment to this charity. Participants in the statistical victim group received statistical information about starvation in Africa, while participants in the identifiable victim group received the picture and story of a little girl struggling with food insecurity. The participants who received the story donated more money to Save the Children, demonstrating that stories have more emotional resonance and inspire more action than statistics (Small, Loewenstein and Slovic, 2007). Interestingly, when participants received the statistical information in addition to the story, their donations were only slightly higher than in a purely statistical approach; the story alone outperformed either statistics-based condition. It is posited that this is because the inclusion of statistical data may place individuals in a cost-benefit framework where they are more easily overwhelmed by the scale of the problem (e.g., the negative emotions associated with those they cannot help) and decide not to act.

Real-world application: Stories can strongly influence the way people plan for retirement. For example, a person who's heard a powerful story about someone who arrived at retirement without adequate financial resources may be more inclined to save for retirement and encourage others to do the same. In contrast, a person who's merely heard statistics about the number of people who are unprepared for retirement may not be as motivated to take action. In this way, stories can serve as powerful motivators for saving for retirement. But stories can also be used counter-productively. For example, people who hear a compelling story of a very unlikely event may nonetheless conclude this event is likely given

the potency of the story (see “prospect theory” for more information about this phenomenon).

UNREALISTIC OPTIMISM

Definition: When predicting the future, people tend to display unrealistic optimism: They believe that they’re more likely than other people to experience positive events and less likely to experience negative events. This is especially true when the future events are controllable and emotionally significant. In these instances, people believe they can take steps to influence the outcome and that they’ll be likely to do so because of their emotional investment in the outcome (Weinstein, 1980).

Research example: College students were asked to judge how likely they were to experience positive and negative life events compared to their peers. Possible responses ranged from much less than average, through average, to much more than average. Positive events included graduating in the top third of their class, traveling to Europe and living past 80. Negative events included being fired from a job, getting lung cancer and being sued by someone. The results showed that participants thought they had a greater chance of experiencing the positive events but a smaller chance of experiencing the negative events when compared to their peers. This bias was especially strong for negative events that were perceived as controllable, probably because participants believed they could take action to mitigate their own risk (Weinstein, 1980).

Real-world application: People may display unrealistic optimism when predicting their financial situation in retirement. For example, they may expect their investments to post better returns than those of other people, particularly if they’ve made the specific investment choices themselves. People are also overly optimistic that they won’t outlive their money. In this way, unrealistic optimism may lead people to anticipate greater financial security than they’ll actually have.

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