

Impulsivity and Consciousness in Human Choice

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When you are asked what you are thinking about, you can normally answer. You believe you know what goes on in your mind, which often consists of one conscious thought leading in an orderly way to another. But that is not the only way the mind works, nor indeed is that the typical way.

Daniel Kahneman (2011, p. 4).

Abstract

Impulsivity is associated with addictions, accidents, low scholar achievement, illegal activity, overweight, and other problems. A number of theories have been proposed to understand the factors that affect it along with its reciprocal, self-control. Among these, are the Energy Model of Self-regulation, the Behavioral Schema Model, several Behavior Economic accounts, and the Affective Primacy Hypothesis. Despite evolving from very different assumptions and frames of reference, these theories seem to imply that human judgments, choices, and decisions are predictably biased by biological, associative, and contextual factors that give rise to errors and impulsive behavior. Evidence emanating from those theories concerning impulsivity and self-control are discussed, along with evidence regarding potential ways to enhance self-regulation.

Key words: Impulsivity, consciousness, choice, decision making, self-regulation, self-control.

1. Introduction

We call behavior *impulsive* when it occurs because its long-range consequences have not been given full consideration. In that sense, for example, choosing the immediate reward of drug use over health, freedom, family, or career may be considered impulsive. Much of human behavior, however, does not involve conscious awareness. Moreover, unconscious actions are not limited to reflexes and perceptual illusions, but include other forms of complex voluntary behavior. We may for example, realize that we have driven a long distance without having a clear recollection of the trip. In fact, the evidence showing limitations in what we believe we experience is all but overwhelming. For example, we know that we are more likely to engage in impulsive acts soon after having exerted self-control and when we are tired, sleepy, hungry, or under time pressure; and we may opt for choices influenced by unnoticed cues in the social or physical environment. While our choices may seem entirely voluntary and rational at the time, as we will see, a growing body of evidence suggests that is often not the case.

Law, religion, science and other social institutions recommend—or demand—that we forgo many forms of immediate gratification, and embrace the arguably more important long-term consequences of our behavior, from better health to eternal salvation. But for most other animals, any delay in

the possession or consumption of a reward (food, water, shelter, or mate) involves the risk of losing it and potentially loose critical opportunities for survival of the individual and the species. So, not surprisingly, humans tend to show patterns of impulsivity that much resemble the behavior of other species despite social norms, and the relative safety of most human environments.

In part because in humans, high impulsivity is associated with addictions, accidents, low scholar achievement, illegal activity, overweight, and other problems, it is increasingly the focus of basic and clinical research, and a number of theories have been proposed to understand the factors that affect it along with its reciprocal, self-control. Among these, are the Dual Systems Theory, the Energy Model of Self-regulation, the Behavioral Schema Model, several Behavior Economic accounts, and the Affective Primacy Hypothesis. These theories evolved from very different assumptions and frames of reference, and yield data that are not always easy to integrate. Nevertheless, they all seem to imply that human judgments, choices, and decisions are predictably biased by biological, associative, and contextual factors that give rise to errors and impulsive behavior. In turn, psychological interventions designed to signal or highlight to the individuals the source of such biases appear to enhance their capacity for self-regulation.

tion and conscious awareness. In this essay, I consider evidence emanating from those theories concerning impulsivity and self-control, and discuss evidence regarding potential ways to enhance self-regulation.

1.1. Energy Model of Self-Regulation

The Ego Depletion or Energy Model states that self-regulation draws from a limited resource, and that such resource is depleted by acts of self-regulation which, in turn, is detrimental to engaging in further self-regulatory acts (Baumeister et al., 1998). The theory was originally based on observations that individuals exposed to unpredictable noise stress show a subsequent decrease in their tolerance to frustration, measured by persistence on an unsolvable task (Glass, Singer & Friedman, 1969). Further evidence came from a study by Muraven et al. (1998) showing that consecutive exertions of self-regulation led to deterioration in performance on subsequent unrelated tasks. The theory was formally presented by Baumeister et al. (1998), along with the now classic study in which individuals who chose to eat radishes (a self-regulatory act), instead of freshly baked chocolate cookies, subsequently gave up working on unsolvable problems sooner (thus showing less self-regulation) than those who had not exerted self-control. At the time, a limited resource used by acts of self-regulation had not been proposed. Then, Gailliot et al. (2007) set out to show in a series of clever experiments that the limited source of energy used by self-regulation acts was blood glucose. The studies persuasively show that a) acts of self-regulation reduced blood glucose levels, b) low levels of blood glucose after an initial self-control task predicted poor performance on a subsequent self-control task, c) initial acts of self-control impaired performance on subsequent self-control tasks, and d) consuming a glucose drink eliminated these impairments. The theory and empirical support, however, are not without refutations, and serious concerns have been raised regarding the validity of the original glucose measures and the very need for a metabolic component (Molden et al., 2012), as well as the effect size and replicability of the results (Hagger et al., 2016).

Nevertheless, the evidence showing a deleterious effect of self-regulation acts on subsequent regulation acts remains undisputed, along with the expectation that a person's capacity to exert self-control and make conscious decisions is not constant but changes dynamically in time as a function of earlier behavior, existing context, and available resources. In a revealing study by Dazinger, Levav, & Avnaim-Pesso (2011), the behavior of eight judges deciding the parole status of 1,112 prisoners was analyzed as a function of characteristics of the prisoner, the crimes, the judges, and the decision context. The results clearly showed that controlling for factors like se-

verity of the crime, time in prison, participation in a rehabilitation program, and prisoner gender and ethnicity, the likelihood of a favorable ruling was predicted only by the ordinal position of the judges' ruling in the work session, and the amount of time since the judges last had a meal break. The food breaks occurred after having ruled on approximately 10 cases per session. In a clear and systematic way, the probability of a favorable ruling declined from $\approx .65$ to zero as the session progressed, and jumped back to $\approx .65$ immediately after the food break, only to decrease to zero again. That is, the results show an increasing unconscious tendency to make the easiest decision, the one that does not involve self-control, as the ego depletion hypothesis predicts. The authors concluded that judges—experts—making repeated rulings, also show an increasing tendency to rule in favor of the status quo.

1.2. Behavioral Schema Model

First proposed by William James (1890), the principle of ideomotor action states that the mere act of thinking about a behavior increases the tendency to engage in that behavior. James proposed that to some degree, thinking about a behavior always involves emitting a muted form of that behavior. A modern version of that principle in social psychology is the *behavioral schema model* (Bargh, Chen, & Burrows, 1996), which states that the perceptual and actional mental representations of the same behavior share many features in common and thus develop strong connections. So, activating one leads eventually to activation of the other; as in *priming*. For example, in a word-recognition task, the word “slice” would be more quickly recognized following the words “bread” or “lemon” than the word “car”, because the latter word has had fewer associations with “bread”. Priming has been shown to occur not only in relation to words or subject-generated thoughts, but unconsciously in response to external stimulation, including perceiving the behavior enacted by others. And priming has been shown to also affect the probability of intentional behavior.

Bargh et al. (1996), for example, designed a study to test the effect of priming on activation of the participants' stereotype of elderly people. Participants in the experiment were instructed to work on a scrambled-sentence task in which participants are given a set of words and asked to put them in order to make a meaningful sentence. The task in the *elderly priming condition* contained words relevant to the elderly stereotype, while excluding all references to slowness, which is a quality stereotypically associated with elderly people, and the dependent variable in the study. For the elderly prime version, the critical stimuli included words like *worried, Florida, old, lonely, grey, bingo, forgetful, retired, wrinkle, rigid, traditional* and *alone*. The task in the *neutral priming condition* contained non-age-specific words in place of the elderly stereotyped words. After completing the scrambled-sentence task a second

experimenter covertly recorded the amount of time the participants took to walk down the corridor after exiting the laboratory room. The main hypothesis was that participants who had been primed with the elderly stereotype would walk more slowly compared to participants who had not been so primed. As predicted, and without awareness of the manipulation and of their own behavior, participants in the elderly priming condition walked slower than participants in the neutral priming condition. When the study was over, a replication of the experiment was carried out, which confirmed the results. According to Bargh et al., the activation of a stereotype by priming in one context resulted in behavior consistent with it in a subsequent unrelated context, while participants were unaware of the influence of the priming events on their own behavior. In other words, the same priming techniques that had been shown in prior research to influence speed of word recognition affected the unconscious occurrence of –voluntary– social behavior.

1.3. Behavioral Economics

Compared to classic economics, behavioral economics incorporates psychological factors of the individuals whose economic behavior is the target of study. While the hypothetical economic person in classic economics is assumed to be a perfectly rational being, behavioral economics does not assume rationality and, instead, looks at how individuals actually behave in specific circumstances (Thaler, 2015). Important phenomena studied by behavioral economics include human judgments, choice, and decision making. The findings of the new science are of critical importance in finance, law, and politics, as the data show that humans are far from perfectly rational in how they assign value, vote, invest, save, buy, and sell. While many examples of unconscious, irrational, voluntary behavior have been examined by behavioral economists (see Ariely, 2008; Thaler, 2015; Kahneman, 2011), we will limit this discussion to three, the effects of default options, intertemporal choice, and framing.

1.3.1. *Default Options*. Johnson and Goldstein (2004) studied organ donation rates in European countries. Because the demand for human organs far outweighs the supply, some countries have implemented or considered actions to improve the rate of organ donations in their populations. The proposed actions range from establishing a regulated market for trading the organs of the deceased, to making organs public property upon death. Johnson and Goldstein suggest that calling for financial incentives or attitudinal changes of potential donors to fix the shortage somehow implies that people actually *decide* to donate or not. However, the donation rate data obtained from European countries look interestingly suspicious, suggesting that something else might be going on. While countries

like Denmark, the Netherlands, the UK, and Germany have rates lower than 30%, others like Austria, Belgium, France, Portugal, and Sweden have rates close to 100%. It may be tempting to think of these data as reflecting fundamental cultural differences between the nations, but because Denmark (4.25%) and Sweden (86%) have so much in common culturally, as do Germany (12%) and Austria (99.98%), and the Netherlands (27.5%) and Belgium (98%), the reason for the disparities in their donation rates must lay elsewhere. Specifically, Johnson and Goldstein found that differences in the way the organ-donation question is phrased on the driver's license application form accounts for the tremendous differences in donation rates. In the countries with low donation rate, the question offers an opt-in choice (check this box if you want to be a donor) while in the countries with high donation rate, the question offers an opt-out choice (check this box if you don't want to be a donor). The organ donation question is a difficult one to answer and most people skip it, but by not checking the box, citizens in some countries become donors, and not-donors in others. The authors argue effectively that as people take the easier default option, they also avoid making the conscious decision whether to donate or not.

1.3.2. *Intertemporal Choice*. When choosing between two identical goods (say, two \$100 bills), one immediately available and another delayed, we tend to prefer the one that is available sooner. This fundamental phenomenon is known as *delay discounting* because the subjective value of the delayed \$100 bill is lower than that of the immediately available bill, even when their nominal value (\$100) is the same. This phenomenon has been widely studied and has been shown to hold for humans as well as laboratory animals (see Madden & Bickel, 2010). As we discussed earlier, discounting the value of delayed outcomes may have been evolutionarily advantageous, as any delay in the possession or consumption of the good incorporates a measure of uncertainty or risk, but it is often maladaptive in modern society. Economists have considered this phenomenon for some time, and have proposed that just as the value of money in a savings account compounds with interest over time, so should the value of future goods be discounted in a compounding fashion as the delay to their delivery increases. In classic economics, consistent with the assumption rationality, the decrease in value associated with delay is expected to be constant over time, so exponential mathematical models that decay at a constant rate are used to describe it. However, humans and laboratory animals have been shown to discount the value of delayed outcomes differently. The subjective value of a delayed outcome decreases rapidly at first, and successively more slowly as the delay increases, such that hyperbolic models describe more precisely the rela-

tionship between subjective value and delay. Equally important is that hyperbolic but not exponential models predict preference reversals, which can be considered irrational but occur regularly in real life. We may, for example, want to lose a few pounds, and start a low-calorie diet. When we make that decision, we are convinced that dieting is what we want to do. As time passes and hunger and temptation increase, however, the value of flavorful food looms larger compared to our goal of a slimmer body, which is still far in the future, giving rise to a preference reversal. That is, despite our initial rational choice to diet, as delay to the goal remains distant while the reward of food is immediate, we often revert to choosing the most immediate of the two outcomes. Our preferences similarly unconsciously tend to reverse when we enroll in a program to exercise or quit smoking. Preference reversals due to relative discounting of delayed outcomes characterize many failures to enact healthy behavior, save for retirement, and protect the environment.

1.3.3. *Framing*. In a series of studies Tversky and Kahneman (1981) demonstrated that the particular ways in which a choice is phrased predictably biases behavior; they called such manipulation *framing*. In a now classic study, the experimental subjects were asked to choose between two alternative programs to combat a hypothetical disease outbreak. In one case they are asked to choose:

- If Program A is adopted, 200 people will be saved
- If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.
- Which of the two programs would you favor?

Of the 152 participants in this group 72% chose Program A and 28% chose Program B. However, when the question was framed:

- If Program C is adopted 400 people will die.
- If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.
- Which of the two programs would you favor?

Of the 155 participants in this group 22% chose Program C, and 78% chose Program D.

The authors argue that because all programs are equivalent in terms of the proportion of people that would live or die from the disease (.33/.66), it is the framing effect that irrationally biases responses toward certainty of life in the case of gains and uncertainty in the case of losses. Their Prospect Theory predicts that when individuals evaluate future outcomes, the expectation of losses is weighed more heavily than the expectation of gains. So, individuals tend to be risk-averse as in the case of the first choice above, and risk-seeking in the case of the latter choice. In addition, the theory predicts that

the displeasure associated with losing (money) is greater than the pleasure of winning (a similar amount). The authors compare the reversal in preference due to framing, with the effects that changes in perspective have on perceptual tasks, and suggest that these findings seriously challenge the notion of rational choice.

1.4. The Affective Primacy Hypothesis

Robert Zajonc (1968) demonstrated that people tend to develop a preference for that which is familiar to them. Generally, while organisms tend to be fearful of and avoid novel stimuli, the repeated exposure to a novel stimulus makes it less aversive, more pleasant. Simply exposing individuals to a stimulus leads them to rate it more positively than similar stimuli that has not been presented before. A number of studies have demonstrated the so called *mere-exposure effect* on a variety of stimuli, including geometric forms, tones, drawings, face images, nonsense words, and Chinese ideographs. Through mere-exposure experiments, Zajonc (1980) provided evidence for the affective primacy hypothesis, by showing that affective judgments are made unconsciously. He repeatedly presented participants with subliminal stimuli such that they did not have conscious awareness or recognition of the repeated stimuli, and still observed a positive affective bias toward the repeatedly presented stimuli. Furthermore, he found that the primes shown more briefly and which were not recognized by the subjects prompted faster preference responses than primes shown at conscious levels. These findings support not only the hypothesis that affect may be elicited unconsciously, but also the position that affect and cognition may be independent processes. The mere-exposure effect occurs in most areas of human decision-making, and it may be the mechanism underlying normalization of aberrant events through media exposure, such as mass shootings and environmental disasters.

2. Self-Regulation and Conscious Awareness

The theories illustrated above attempt to explain behavioral data gathered in widely different areas of knowledge, from learning principles to social interactions, and economics. While it might not be productive to devise a single principle to encompass the various forms of behavior addressed by the theories, the empirical evidence they have generated appears to consistently show systematic biasing of human behavior by unconscious processes and unrecognized contextual factors. In every case, the data point to limitations in what we believe are our conscious, rational, and voluntary judgements, choices and decisions.

Daniel Kahneman (2011) proposed his dual systems theory as a metaphor to account for the functioning of the human mind. His is not a theory in the scientific explanatory

sense; it is an accessible description of judgements and decisions as products of fast, easy, automatic processes based on associative learning he calls system 1, and slow, effortful, deliberate processes he calls system 2. Kahneman's stated goal in proposing the theory was to offer a vocabulary to be used when talking about the human mind. The terms *system 1* and *system 2* were borrowed from earlier dual systems theories, particularly Stanovich and West's (2000) work, and are not intended to name existing neurological structures, but to classify general forms of cognitive processing for which there is behavioral evidence. Nevertheless, Kahneman's two-system metaphor echoes neurological dual-process theories of cognition in proposing one automatic and one executive component (McClure et al., 2004; Kable & Glimcher, 2007). According to Kahneman's classification, it is the fast, automatic processes that are mostly linked to unconscious biases, despite their high adaptive value. He proposes, however, as do other authors, that the deliberate, executive, system 2 can take over when the problem being faced is too complex to be solved by automatic heuristics alone. In the following paragraphs I review three potentially viable interventions to enhance an individual's ability to self-regulate, that are aimed at bringing conscious awareness to critical aspects of the choice situation.

2.1. Reminders and Checklists. In the study about judges ruling on parole requests described earlier (Dazinger et al., 2011), experts were not able to maintain consistent evaluation criteria as they became tired and hungry over the course of their work session. Clearly, that is a case where the judges were not consciously aware of their inconsistency in applying the law. Such inconsistencies are common when complex decisions are made, often leading to serious errors with potentially grave consequences (Gawande, 2010). In aviation, the military, medicine and other areas, the use of checklists has proven to be a simple but very effective technique to systematically bring to the attention of the deciding individuals the critical aspects that need to be considered in making the decision. In addition, good checklists obviate the routine tasks so experts can instead focus on the complexities of the task. An appropriate checklist could provide a rubric that judges can use to ensure that regulations are applied consistently. Checklists may appear simplistic but the evidence shows they would work in many cases, including judicial decisions. In medicine, the use of checklists has significantly decreased mortality and the error rates. For example, although surgical care can be effective, it also involves considerable risk of complications. It is estimated that 234 million operations are performed annually (Weiser et al., 2008). Studies in industrialized countries have shown a perioperative rate of death from inpatient surgery of 0.4 to 0.8% (936,000 to 1,872,000 deaths) and a rate of major complications of 3 to 17%, (7,000,000 to 39,780,000 cases)

while there is evidence that at least half of all surgical complications are avoidable (Gawande et al., 1999). To ensure the safety of surgical patients worldwide, the World Health Organization (Weiser et al., 2010) published guidelines identifying multiple recommended practices. Haynes et al. (2009) collected data prospectively before (N=3733) and after (N=3955) the introduction of surgical checklists on noncardiac surgery patients. They found that the rate of death declined from 1.5% before the checklist was introduced to 0.8% afterward. Moreover, inpatient complications decreased from 11% of patients at baseline to 7% after introduction of the checklist.

2.2. Prospection Training. Delay discounting often reflects myopic horizons and valuation of the future. Such is the case of drug addicted individuals, who repeatedly choose the immediate pleasurable drug effects over health, risking freedom, family and career. A heightened rate of temporal discounting is characteristic of all addictions and many other health problems including obesity (Weller et al., 2008; Lu et al., 2014), hypertension (Chapman et al., 2001), diabetes (Reach et al., 2011), schizophrenia (Wing et al., 2012), and others. The rate at which individuals discount the value of delayed rewards is relatively stable in adults, and is generally higher in children and lower in the elderly. A prospective study of the relationship between discounting rate and smoking showed that discounting rate is an independent predictor of smoking initiation, and that it is not changed by smoking (Audrain-McGovern et al., 2009). However, recent research shows that interventions aimed at bringing awareness to temporal relationships between events, particularly those in the future, can decrease delay discounting rate measured in the laboratory.

Episodic future thinking (EFT) is a form of prospection in which individuals generate personal narratives about the future (Atance & O'Neill, 2001). These narratives allow individuals to imagine the future by invoking vivid imagery and details surrounding specific events (e.g., starting a new school year or retiring from work). To some extent, most people spontaneously engage in EFT. In fact, naturally occurring EFT appears to modulate temporal discounting, allowing possible future outcomes to better guide present behavior (Bickel et al., 2017). For example, greater vividness of naturally occurring EFT in adolescents is associated with lower rates of delay discounting (Bromberg et al., 2015), suggesting that EFT is integral to decisions involving valuation of the future. Although delay discounting rate appears to be stable during adulthood, the evidence showing improvement after EFT suggests that, unlike other trait-like variables, the degree of discounting that characterizes individuals must depend on abilities learned early in life that remain amenable to change by prospection training.

2.3. Mindfulness Training. The proposed definition of *mindfulness* offered by Bishop et al. (2004) involves two components: a) the self-regulation of attention, so that it is maintained on immediate experience, and b) the adoption of an attitude characterized by curiosity, openness, and acceptance toward one's experiences in the present moment. Mindfulness training has been used effectively to treat pain (Kabat-Zinn, 1982), and reduce cognitive vulnerability to stress and emotional distress (Shapiro et al., 1998; Williams et al., 2001). The capacity to evoke mindfulness is developed using meditation techniques adapted from ancient Buddhist spiritual practices (see Williams & Kabat-Zinn, 2013) directed at increasing awareness and responding effectively to emotional distress and maladaptive behavior.

We are regularly distracted by stimulation around us, making us more vulnerable to perceptual errors, framing effects, and implicit choices. Mindfulness training has been proposed as viable intervention to enhance attention in normal and clinical populations. For example, a randomized controlled study by Semple (2010) tested the potential of mindfulness training to enhance vigilance, concentration, inhibition of distraction, and executive control. Community adults (N=55) were assigned to either a mindfulness meditation group, a progressive muscle relaxation group (to control for effects of physical relaxation on attention), or a blind wait-list group (to control for practice effects of repeated measures). The pre-post evaluations included measures of attention, vigilance, performance, anxiety, and mood. The intervention consisted of mindfulness or relaxation training and supervised practice, and four weeks of twice-daily practice at home. Their results showed significantly greater discriminability on the signal detection task than did the other groups. Also, significant improvements in sustained attention following mindfulness meditation were observed, which did not appear to be mediated by relaxation or practice effects. However, no differences in performance were found between the groups on measures of concentration and inhibition of distraction. These results support current considerations of mindfulness meditation to enhance basic attention ability. One critical missing component

from this intervention, is a detailed description of the mindfulness training procedure, which prevents direct replication and evaluation. Perhaps due to its origins in ancient spiritual practices, it has been difficult to arrive at a general consensus on the specific details of the training method and prescribed practice. Nevertheless, the significant improvements observed in this and other experiments (Creswell, 2017; Hendrickson & Rasmussen, 2013) suggest that some forms of mindfulness training can be effective to enhance conscious awareness during choice and decision making.

3. Conclusion

Despite our individual and collective subjective experience, scientific evidence arising from very diverse sources coincides in showing systematic unconscious biasing of voluntary behavior by biological, associative, and contextual factors. While these findings have profound implications for the notion of a Cartesian rational mind, they merely expose neurological and behavioral mechanisms that must have been evolutionarily advantageous to humans and other species. The supporting evidence reported here is by no means exhaustive, but taken together it is all but undisputable. To be sure, these ideas are not new, and more competent scholarly arguments can be found in the works of Ariely, Dennett, Hardin, Kahneman, Skinner, Tversky, and many others. The goal of this essay is simply to propose that it is essential for us to formally acknowledge the limitations to rationality, volition, and freedom of choice we known exist, and that it is possible to devise and implement strategies to enhance self-regulation, and limit opportunities for errors and impulsive choice. Acting to facilitate self-regulation through conscious awareness is important and necessary. While delay discounting by heroin addicts may appear remote and impersonal to many, so does discounting the future of the environment, which affects us all. Recognizing our cognitive limitations will not make us weaker; it will provide the space needed to develop and implement proven strategies to enhance our humanity.

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