

Nudging healthier behavior: psychological basis and potential solutions for enhancing adherence

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Summary

The most common approaches for increasing healthy behavior and adherence are based on stages of change models. Despite a rich literature about health behavior theories and the efficacy of educational interventions, the actual factors that contribute to increased patients' adherence are still debated. However, reasoning and decision-making research may provide new insights into how to improve adherence. The dual process theory of thought posits that there are two parallel systems of reasoning: fast thinking, encompassing fast, effortless, and default-based behaviors; and slow thinking, consisting of slow, effortful, and rule-based decisions. The dual process theory underlies the nudge concept: the idea that indirect suggestions may exploit fast thinking behaviors in order to obtain non-forced compliance to physicians' prescriptions, and thus increase adherence. Exploiting default behaviors as nudges for enhancing adherence is still an under-used approach for osteoporosis treatment. Novel ideas of such interventions are discussed and proposed.

KEY WORDS: adherence; osteoporosis; medical treatment; educational interventions; behavioural interventions; dual-process theory of thought; nudge theory.

Introduction

The promotion of healthy behaviors (1, 2), such as increasing physical activity, good sleeping habits, and avoiding unbalanced diets, is a critical aspect of today's strategies for the prevention of disease. The field of healthy behaviors is strongly associated with the concept of adherence, defined by the World Health Organization as, "the extent to which a person's behavior, such as taking medication, following a diet, and executing lifestyle changes like exercising, corresponds with agreed recommendations from a health care provider" (3). The general problem of promoting healthy behavior, including the particular issue of increasing adherence, is based on the idea of influencing behavior (i.e., making people behave in the manner prescribed by their physicians' recommendations).

Within health psychology, many theories for developing interventions have been presented (2, 4). Stages of change theories represent some of the most effective ideas on which to base behavior modification programs (5-7): multi-faced educational interventions are a common way to implement stages of change theories (8). Such interventions may include actions such as nursing-care interventions, decision aids, telephone-based counseling, and follow-ups. The critical point is that, overall, the adopted actions are implemented according to the basic idea that behavior change relies on a series of factors that depend on a distinct stage of transition. Each stage of transition can be thought of as an ideal step from one behavior to another (healthier) behavior (9-11). For example, Weinstein's precaution adoption process model (9, 10) and the transtheoretical model (11) assume the following consecutive stage processes: 1) the individual is unaware of the problem, 2) the individual is figuring out what to do, 3) the individual is planning their actions, 4) the behavior of the individual changes according to their actions, and 5) the new behavior is maintained (the precaution adoption process model includes other assumptions about the stages including an indecisiveness stage). Moreover, implemented programs are also enhanced by the use of reinforcements (i.e., interventions that make a behavior more likely to be presented), both tangible and intangible. The former can be money, coupons, or gadgets, whereas the latter are usually symbolic rewards. Despite the success and wide use of interventions based on stages of change theories for promoting healthier behavior, the actual factors that cause the efficacy of these interventions are not clear.

Outside classical health science research, in particular health psychology, new approaches have been recently developed. Within the study of thinking and reasoning, the so-called dual process theory of thought (12, 13) has been exploited to help individuals adopt better (in relation to some criteria) choices. According to the nudge approach (14), it is possible to design specific "choice architecture" (i.e., the context and setting in which an individual makes a decision) that enables the encouragement of a particular choice.

The aim of this paper is to describe the psychological basis of the nudge theory and the nudge approach in order to develop alternative interventions to promote positive behaviors, beyond classical methods. Potential solutions for increasing medical adherence will be also discussed.

The dual process theory of thought

The seminal works of Kahneman and Tversky (12) greatly contributed to the development of the dual process theory of thought. This general expression includes a variety of models, which share the idea of the coexistence of two systems of thinking and their basic features. Several names have been proposed to indicate these two systems, including generic labels like "System 1" vs "System 2," "intuition" vs "deliberation," "heuristic" vs "analytic" (15). In this paper, Kahneman's terminology has been adopted, which distinguishes between fast and slow thinking (12). The former is a fast, effortless, associative-based, and context-dependent form of thinking, whereas the second is a slow, effortful, rule-based, and abstract form of thinking. Following Slovic (13, 16), fast thinking's basic operations are based on similarity and contiguity, making it able to represent the statistical structure of the environment. This form of thinking operates in a fast, automatic way without requiring particular effort.

For fast thinking, associative processes operate on the basis of similarity and contiguity. It aims to represent the statistical structure of the environment; such associative processes are fast and do not require special effort. In contrast, the slow thinking rule-based system works sequentially (thus, it is slower than the associative system) and is abstract and symbolic. Such a process requires specific constraints on the manipulation of mental symbols and well-defined procedures to draw conclusions, which requires time and considerable cognitive engagement. For example, imagine a tired person in a room containing only a table, there are no chairs. Through the associative system, the table affords in a fast and effortless way the opportunity for the person to perform a desirable action (i.e., using the table as a chair and thus sitting on it). On the contrary, judging the legal implications of potential actions requires the involvement of the rule-based system, entailing a slow, abstract, and hard form of reasoning. Actually, these are two examples of a categorization process: assigning the category "potential object to sit on" to a table and assigning the category "lawful or unlawful" to potential actions. However, the cognitive process involved in these two cases is very different: the first is fast and associative and the second is slow and rule-based. Fast thinking is related to every thought that comes to mind in a natural, default way, without the necessity of a step-by-step, deliberated, and controlled thought process. For example, if an individual is asked to multiply three by three, the answer immediately appears in their mind: they are not aware of the mental steps necessary to achieve the mental output. Default decisions, such as this one, are very common in everyday decision-making processes, for example, deciding which seat to take in a waiting room, grabbing the usual brand of beer at the store, and following the same route to work when driving. In all these cases, if there are no "special needs" to be attended to (e.g., if something strange that requires deliberative reasoning occurs in the waiting room, near the beer shelf, or on the route), these tiny, default decisions are made by means of an "autopilot system," in a fast, automatic, and

effortless way. On the contrary, when a layperson is asked to multiply twelve by fourteen, a lot of effort by the slow and controlled deliberative system is required. Slow thinking, commonly, is a lazy controller of fast thinking, and it is able to inhibit the default decision if there are enough employable mental resources. For example, imagine being at a fancy party with waiters providing free, delicious pastry. Usually, fast thinking leads to taking the pastry, because it is sweet and desirable. However, in the case of being on a diet, the slow thinking system could inhibit the gesture of taking the pastry: the latter event will occur if there are enough mental resources available to stop the default action. Such resources may be reduced by stress, attentional demanding tasks, or similar.

Generally, the human default system for decision-making is fast thinking (12, 13, 16). This system is organized by a positive-feedback loop with affective and emotive states: this means, "what we feel is somehow bound to what we are thinking" (16) either when a physiological state induces a cognitive appraisal or when a cognitive state determines a physiological response. Using the terminology of Slovic (16), such an intuition-affective loop is automatic and unconscious. Fast thinking operates in parallel with and modulates, through inhibition, the intuitive-affective loop. Schematically, the "automatic pilot" is based on the intuition-affective loop, which is the default and most common basis for decision-making processes, whereas slow thinking may operate autonomously, inhibiting fast thinking. The cognitive reflection test (CRT) (17-19) is commonly employed to measure the tendency to employ analytical (slow) thinking at the expense of default, fast responses. The CRT is composed of three questions, which each has an (incorrect) apparent answer, easily prompted by fast thinking, and a (correct) less accessible answer, requiring slow thinking to inhibit the default answer and some deliberation to find the correct response. For example, *a bat and a ball cost \$1.10 in total. The bat costs \$1.00 more than the ball. How much does the ball cost?* The most natural response is \$0.10 because the bat costs \$1.00 more than the ball and the two together cost \$1.10, so $\$1.10 - \$1.00 = \$0.10$. However, if slow thinking has enough resources, it is possible to realize that if the ball costs \$0.10, then the total cost will be \$1.20 (\$0.10 for the ball and \$1.10 for the bat), not \$1.10. In fact, the ball costs \$0.05, so the bat costs \$1.05 (an additional \$1 compared to the ball) and their total sum is \$1.10. Therefore, the CRT measures the inhibition of the default system, the most natural response using fast thinking, by the slow, effortful thinking process.

It is important to note that both systems of thinking can result in a rational response, and the majority of individuals' default, everyday decisions leads to "rational" responses: recognizing that something is edible, the gender of a passerby, or the correct route to return home. However, for particular reasoning tasks, the adoption of associative-based fast thinking can result in so-called reasoning bias. For example, given the question, "In a maternal care unit, is it more likely to meet a woman or a pregnant woman?", the most natural, obvious response is "a pregnant woman". This answer comes naturally to mind: a pregnant woman is a very representative example of someone that might be met in a maternal care unit. However, the rational response is "a woman" because the set of "pregnant women" (PW) is a subset of the larger set "women" (W). From a probabilistic point of view, the conjunction rule holds: the probability of W is always equal to or higher than the probability of PW. A violation of

the conjunction rule is called a conjunction fallacy (20). According to Kahneman and Tversky (20), this reasoning bias depends upon the use of a representativeness heuristic: to judge the probability of an event in terms of “the degree to which [an event] (i) is similar in essential characteristics to its parent population, and (ii) reflects the salient features of the process by which it is generated” (21). The representativeness heuristic is a fast similarity-based form of thinking: the response “pregnant woman” is more similar to the contextual information, maternal care unit, described in the question, compared to the response “woman.”

Turning to slow thinking, even in this case, the deliberative, controlled system can lead to an irrational response. For example, given a mathematical problem, an individual can mistakenly apply an improper procedure to solve it. The thinking process that applies the procedure might be slow, effortful, and deliberative but the final response will be not correct. In sum, the dual process theory of thought affirms the coexistence of two different forms of thought: a default, fast, and effortless form of thinking versus a deliberative, slow, and effortful form of reasoning. In the next section, how to exploit the former to create an ad hoc architecture of choice, able to promote better decisions, will be described.

The nudge approach

In the last decade, within behavioral sciences, and in psychology and particularly behavioral economics, an increasing amount of attention has been devoted to the “architecture of choice” concept (22). This expression refers to the way or the context in which choices can be presented to decision-makers, and it has been made popular by Richard Thaler and Cass Sunstein in their highly influential book, *Nudge: Improving Decisions About Health, Wealth and Happiness* (14). The context in which a decision is made, for example how options are arranged, such as their order, may significantly affect peoples’ decision-making processes and several other of their perceptual and cognitive processes (23-30). Therefore, Thaler and Sunstein’s key idea consists of exploiting dual process theory’s principles to create an architecture of choice, able to nudge individuals toward choices that are in their best interest without limiting their freedom.

A preliminary topic that needs to be discussed before continuing is addressing the critical ethical issues that might be related to such an approach. Manipulating an architecture of choice can be thought of as a form of behavioral manipulation of other people. In their book, the Authors show how it is impossible to avoid some sort of control over the choice of architecture. Deciding not to explicitly manipulate the context in which a decision is made means to leave only to chance how factors that may affect choice will influence individuals’ decisions. They propose adopting a philosophical point of view called libertarian paternalism: nudging peoples’ choices toward directions that bring advantages to the individual and the community without eliminating the decision-makers’ freedom.

The nudge principle is based on the idea of promoting behavior that organizes the architecture of choice so that positive behaviors are associated with the activation of fast thinking. Every day, each individual is called upon to make an impressive number of decisions, from irrelevant (such as deciding what to do first, drink water or open a window) to crucial, with long-term consequences: (like quitting one’s job or buying a house). Given that employing deliberation (i.e., slow

thinking) is resource demanding and requires effort, the default decisions that the context suggests will be enhanced. In other terms, if the environment is designed to prompt a certain action from our “auto-pilot” (slow thinking), such actions will be enhanced. Therefore, a nudge consists of an indirect suggestion that can achieve the non-forced promotion of a certain behavior. Taking into account a large sample of people, statistically, the influence of an architecture of choice will be very high. For example, using the nudge principle, it is possible to affect food consumption in a canteen setting (31). Through the manipulation of the location and availability of different kinds of food, it is possible to reduce the consumption of unhealthy food, and, at the same time, to enhance the consumption of healthy food. When an individual is in a canteen line waiting to choose their food, the time for choosing is limited (there is pressure from other people waiting behind the individual, the lunch break is scheduled for a block of time, or the individual is speaking with other people), so usually, the availability for slow thinking is also limited. This entails that decisions will be prompted by fast thinking for the large part: default, effortless decisions will be statistically adopted by the majority of the diners. If the manager of the canteen places healthy food in easy-to-reach locations, whereas unhealthy food is difficult to locate, the former will be selected with a higher likelihood, given they are the option associated with fast thinking. Moreover, promoting the choice of healthy food in this way does not violate an individual’s freedom of choice: if they want to, it is still possible to choose the unhealthy food by actively deciding to eat it and striving to locate it, but on average this is less likely. Another example is related to the size of the plate that people usually eat from. On small plates, the same quantity of food appears to be a larger quantity compared to big plates, where it seems that the plate is not full enough. It has been shown that moving from a 12-inch plate to a 10-inch plate steers people toward eating 22% less (32, 33).

Organ donation is another example of the success of the nudge approach. A study took into account the issue of organ donation in Germany and Austria (34, 35). These two countries are similar in many respects (geographic location, cultural aspects, and socio-economic status); however, in Germany, it is necessary to make an active decision to be enrolled as an organ donor, whereas in Austria, each citizen is enrolled as a donor by default. This difference results in a discrepancy in the proportion of donors of about 87%: in 2003, only 12% of Germans were donors compared to 99.98% of Austrians. From a dual process theory of reasoning point of view, in Germany, to become a donor, it is necessary to make use of slow thinking, and therefore, spend time and cognitive resources to make the decision: going to the department that is responsible for organ donations, reading and signing a contract, and so on. On the contrary, in Austria, the same effort is required to avoid becoming a donor. The crucial point is that any choice that requires an active effort will be generally penalized, in consideration of a large number of people. The efficacy of the nudge approach has been observed in a variety of other behaviors, including fines being paid more punctually and better pension savings’ decisions.

Increasing adherence using the nudge approach

As far as osteoporosis treatment is concerned, the adherence to medical prescriptions and dietary habits is a very im-

portant issue for patients (36-42). In spite of the increasing heterogeneity of available efficacious drugs for osteoporosis, poor adherence reduces the overall effectiveness: adherence to osteoporosis drugs is relatively low (43, 44). Another example is related to dietary habits: calcium is critical for bone health, especially in the younger population, but its consumption is often too low (39). Non-adherence to drugs and dietary prescriptions is not an easy problem to deal with because of the difficulties in monitoring patients' daily lives. Moreover, due to social desirability bias, that often characterizes the relationship between a physician and a patient, a patient tends to report the behavior that the physician expects, whereas the actual behavior of the patient is very different. This is only one of the several psychological variables that are related to the adherence issue. Other variables include habits, motivations, intentions, beliefs, and failures to perceive increased risk, in the case of non-adherence.

Non-adherence can be classified as intentional non-adherence and non-intentional non-adherence (44). The first is related to a conscious choice to not follow a physician's recommendations. In this case, it is important to focus on the patients' beliefs about the safety of the treatment and the necessity to take the medication. Non-intentional adherence is related to forgetfulness or carelessness. In this case, the nudge approach, given its reliance on default-based decision-making processes, represents an ideal tool to overcome the non-intentional non-adherence issue. Indeed, the dual process theory of reasoning and the nudge concept have not yet been exploited to improve adherence to their greatest extents. Therefore, it is possible to develop new or complementary solutions to stimulate positive behaviors based on current research about human thought.

Understanding the default behaviors of a patient can help to establish a connection between their habits with the assumption of a certain drug (45). For example, if the patient owns a dog and every morning takes the dog out for a walk, it is possible to suggest that the patient associates, in some way, the action of taking the drug with the preparatory actions of taking the dog out. Another example is related to awakening: people that wake up using an alarm might connect, in some way, the action of turning it off with the action of taking drugs.

Such a basic approach can be further developed with the following ideas that require the creation of a novel object or the implementation of an already existing technology in items of common use (45). For example, by using wireless technology, the alarm clock could be connected to a pill container so that when the alarm is turned off, a light automatically turns on in the pill container. Alternatively, if the drug must be taken during breakfast, the use of a special cup (employed by default by the patient to take their beverage during breakfast) with a small container placed on its external surface, which can be loaded with pills, may help. A special tray with different spaces for drinks, food, and pills could also be used. In sum, understanding the habits, default behavior, and environment in which a patient lives may help the physician and the patient together to discover default behaviors that can be associated with the action of taking drugs in order to exploit fast thinking properties to increase adherence.

Conclusions

Recent contributions from psychological research into thinking and decision-making might provide new solutions for the

non-intentional non-adherence issue. The dual process theory of reasoning and the nudge concept are useful tools that can be integrated into more traditional approaches that are already being applied for the promotion of the health behaviors. The use of default behaviors to change patients' bad habits is still under-employed in its concrete application. Future research should address their efficacy using evidenced-based research, and health-behavioral programs should incorporate them to become more efficacious in the promotion of healthy behaviors.

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