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Some Observations from Behavioral Economics for Consideration in Promoting Money Management among Those with Substance Use Disorders

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Abstract

Background—Behavioral economics research has revealed systematic biases in decision making that merit consideration in efforts to promote money management skills among those with substance use disorders (SUDs).

Objectives—The objective of this article was to briefly review the literature on five of those biases (i.e., hyperbolic delay discounting, defaults and preference for the status quo, loss aversion, mental accounting, and failure to account for opportunity cost) that may have particular relevance to the topic of money management.

Methods—Selected studies are reviewed to illustrate these biases and how they may relate to efforts to promote money management skills among those with substance use disorders. Studies were identified by searching PubMed using the terms “behavioral economics” and “substance use disorders”, reviewing bibliographies of published articles, and discussions with colleagues.

Results—Only one of these biases (i.e., hyperbolic delay discounting) has been investigated extensively among those with SUDs. Indeed, it has been found to be sufficiently prevalent among those with SUDs to be considered as a potential risk factor for those disorders and certainly merits careful consideration in efforts to improve money management skills in that population. There has been relatively little empirical research reported regarding the other biases among those with SUDs, although they appear to be sufficiently fundamental to human behavior and relevant to the topic of money management (e.g., loss aversion) to also merit consideration. There is precedent of effective leveraging of behavioral economics principles in treatment development for SUDs (e.g., contingency management), including at least one intervention that explicitly focuses on money management (i.e., advisor–teller money management therapy).

Conclusions and Scientific Significance—The consideration of the systematic biases in human decision making that have been revealed in behavioral economics research has the

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Declaration of Interest

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potential to enhance efforts to devise effective strategies for improving money management skills among those with SUDs.

Keywords

behavioral economics; substance use disorders; money management; delay discounting; self-control

INTRODUCTION

Managing money is made difficult by one of the same challenges that makes managing many other important day-to-day activities such as exercising regularly, making healthy food choices, and ingesting alcohol responsibly difficult, namely, these choices pit immediate against longer term consequences. Despite best intentions to save money, eat healthier, or drink moderately, people have imperfect self-control and often struggle with this balance between the immediately available and reinforcing options and their longer term best interests. Of course, one's ability to make wise money management choices is influenced by many factors, including limited resources (e.g., time, information, computing capacity) for thoroughly evaluating the many relevant variables in a timely manner, rendering it impractical if not impossible to rationally consider all possible outcomes. It is under such constrained conditions where the influence of certain biases in how humans make choices (i.e., decision making) can often be quite pronounced.

Behavioral economics is a discipline that seeks to understand how people make choices under constraint and is a departure from classical economics, which assumes that people collect all available information and consider all possible relevant factors in seeking to make optimal choices (e.g., 1,2). If classical economics held true, of course, then the highly prevalent suboptimal health behaviors that plague modern industrialized society such as substance abuse, unhealthy eating, obesity/physical inactivity, and poor medication adherence would at least be less common if not nonexistent. Research in behavioral economics has demonstrated many cases in which rationality, as defined by classical economics, is reliably violated and has identified some important systematic biases in how people make choices. These biases have the potential to advance the understanding of why people make the highly prevalent and clearly suboptimal choices mentioned above. Indeed, recently several authors have begun systematically identifying these biases and applying them to enhance understanding and suggest novel interventions for common problems such as substance use disorders (SUDs) (e.g., 3), other health-related behaviors (e.g., 2,4), and money management (e.g., 2,5). Most of these efforts have been in the form of articles appearing in academic journals, but there have been others that have been directed at the general public, most notably the recent best seller *Nudge* (2). Importantly, in addition to identifying common biases that make optimal decision making challenging, the authors of *Nudge* elucidated how the structure of choice situations, or the "choice architecture," can be modified to accommodate these biases and nudge people toward more optimal decisions.

Understanding these biases and identifying which may be exacerbated in those with SUDs may help clinicians to develop more effective practices to aid patients with those disorders

improve their money management skills. There is relatively extensive behavioral economics research applying consumer demand theory to understanding SUDs (e.g., 3,6–12). However, this article is limited to research related to choice biases that have potential relevance to money management, which is the topic we were invited to address in this special issue of the *American Journal of Drug and Alcohol Abuse* examining money management among those with SUDs. We also discuss two treatments for SUDs that, at least in part, make explicit use of behavioral economics. One is a relatively thoroughly researched intervention (voucher-based contingency management) that uses financial incentives to increase abstinence from substance use and improve other therapeutic targets (13). The other is a more recently developed intervention (advisor–teller money management (ATM) therapy) that specifically targets money management among those with SUDs and other serious mental illnesses (14–16). This brief discussion of treatments is not meant to be exhaustive by any means but rather to provide two examples of how those developing and providing treatment related to money management might consider leveraging behavioral economics principles in their treatment development efforts.

GENERAL BEHAVIORAL ECONOMICS PRINCIPLES

Delay Discounting

Delay discounting (also called temporal discounting) research reveals that people and many other organisms “discount” the value of reinforcers as an orderly function of temporal delays to their availability (17–19). This is the process underpinning what behavioral economists have referred to as a bias for the present (20), that is, a bias for the more immediate of available reinforcing options even when doing so means forgoing a larger but more delayed reinforcer in the future. This bias is illustrated with a hypothetical example of the value of \$1000 available under different delays in Figure 1A. The dark bar represents the subjective value of \$1000 when immediately available. As the delay to receiving the \$1000 is increased moving to the left in the figure, its subjective value decreases (i.e., is discounted). Importantly, classical economics has assumed exponential discounting in which delay reduces the subjective value of an outcome or option at a constant rate across differing durations of temporal delay, but overwhelmingly the available evidence indicates that delay discounting is hyperbolic in nature (e.g., 21,22). That is, the subjective value of an option decreases rapidly at short delays, and then loses additional value more gradually as delays increase. In Figure 1A, for example, the subjective value of \$1000 received at a 1-week delay has dropped sharply compared with its value when immediately available, and continues to drop sharply at a 1-month delay, but beyond that point additional delays result in relatively small decrements in subjective value.

While a growing body of evidence is demonstrating how hyperbolic discounting is associated with a broad range of problems in contemporary environments, in the context of foraging animals or hunter-gatherer societies, of course, a high premium on immediate consumption over even short delays was likely quite adaptive. In such an environment, a small delay might greatly increase the risk that a particular outcome would not materialize due to competition from another hunter/forager, an accident preventing access, or some other change in conditions (21,23). In many contemporary environments where food and

other primary reinforcers are relatively abundant, discounting can undermine longer term utility, leading to poor health and fiscal outcomes (3).

Important to understanding suboptimal decision making that is common among those with SUDs, hyperbolic discounting helps to explain what behavioral economists call “preference reversals” – circumstances where people may say from a temporal distance that in the future they will choose the option that is in their best interest, but when the time rolls around to where the choice faces them in the present, they make a different and suboptimal choice (24). Consider a familiar and simple example of a person who is planning to remain sober and avoid the wedding cake when she attends her coworker’s wedding the following week, but once at the wedding indulges in the open bar and happily partakes in the sea of desserts. To take this example a step further, assume that we have determined the hyperbolic discounting functions representing the values of both consuming drinks and abstaining from alcoholic drinks for this person (Figure 1B). The smaller, sooner reward is the psychological and social rewards of drinking at the wedding while the larger, later reward is the benefit of abstaining (i.e., no hangover, fewer calories, fewer embarrassing events at the wedding, and so on). One week before the wedding, the subjective value of abstaining is higher than the value of consuming the drinks in a week’s time, and her preference is to abstain from drinking at the wedding. But by the time she is at the wedding faced with the choice of whether to order a drink, the discounting functions for both have crossed, and drinking now has a higher present subjective value than abstaining, despite the fact that the total possible available value for abstaining is higher in the future. This person is likely to reverse her preference from what she stated a week earlier and choose to drink at the wedding rather than abstain as originally planned. Of course, preference reversals of this type are commonplace and of little overall significance for most of us. However, should they become a regular feature of one’s behavioral repertoire, they can have devastating consequences. For example, substitute drinking at lunch each day rather than at the wedding in the aforementioned example and it is not hard to imagine how someone could quickly get caught up in a behavior pattern with serious untoward consequences.

Delay discounting is a fundamental bias with broad cross-species generality (e.g., 22,25,26). As in all things biological, there are discernible differences in the degree to which individuals discount delayed rewards. For example, greater discounting of delayed rewards is associated with younger age (e.g., 27,28) and lower educational attainment (e.g., 29–31). Cultural differences may also be a factor (32). Of particular relevance to this article is that individuals with SUDs discount more than sociodemographically matched controls without SUDs (3). Indeed, those with cocaine (33,34), opioid (35,36), alcohol (37,38), and tobacco use disorders (e.g., 39–42) display increased levels of delay discounting relative to controls (cannabis use may deviate from this pattern (43)). Certainly this evidence suggests that relatively pronounced discounting is prevalent across many different types of SUDs (3) and would be expected to exacerbate the challenges of money management in this population. Delay discounting rates are also more severe among those with serious mental illness, including schizophrenia, borderline personality, and bipolar disorder (44,45), suggesting that it may be expected to be especially problematic for money management among those with comorbid SUDs and serious mental illness. Interestingly, some emerging evidence suggests that individual differences in delay discounting may be related to individual differences in

working memory (46) and that improving working memory via training decreases discounting rates among adults in treatment for stimulant use disorders (47).

A more thoroughly researched strategy for reducing the adverse influence of delay discounting on decision making is to make what are referred to as commitment responses. The seminal studies of the commitment strategy in behavioral economics research were conducted in the preclinical laboratory using food-deprived pigeons that made a series of choices between options involving smaller but more immediately available amounts of food versus larger, more delayed portions (26,48). The pigeons learned to make a commitment response in the present that precluded them at a future time from being able to choose the smaller, more immediate over the larger, more delayed reward. In one of those studies (26), for example, pigeons were first offered a red key that when pecked immediately resulted in the delivery of a small food reward, but when pecked after the light went dark resulted in the delivery of a much larger reward. In this condition, most pigeons always pecked the red key when lit and received the smaller reward. When the setup was later changed so that the key glowed green for a few seconds before turning red and pecking the key while it was green prevented it from turning red, 3 out of the 10 pigeons in the study learned to peck the green key, eliminating the option of the smaller immediate reward and accessing instead the more delayed, larger reinforcer.

More recent research has investigated this same type of commitment response approach with people. For example, in an experiment examining procrastination, experimenters posted job ads on the MIT campus to hire native English speakers to proofread papers by other students, with payment contingent on the number of errors detected (\$.10/error) and completing the assignment on time (\$1.00 deducted for each day beyond the deadline, with no penalty or advantage for early submissions). Sixty students were assigned to one of three conditions. In all three conditions students were asked to proofread three simulated student papers over 21 days. In condition 1, deadlines for submitting the completed documents were evenly spaced and determined by the experimenters, with one paper due by the end of each 7-day period. In condition 2, the deadline was also determined by the experimenters but only required that participants submit the three texts by day 21. In condition 3, participants were asked to set their own deadlines within the 21-day submission period and were informed that they would incur penalties for any work submitted after the self-selected deadlines. Participants in this study performed significantly better, as defined by more errors identified and fewer late submissions, when they had externally imposed precommitments to regularly spaced deadlines every 7 days as compared with when they were asked to submit all texts by a final deadline at the end of 21 days, with mean delays of approximately 4 days in the former versus 12 days in the latter (see figure 2 in Ref. 49). Regarding the self-selected deadline condition, you might expect that a person who has perfect self-control would be best served by setting the official deadlines for all papers as the last possible date and completing the papers on an earlier, self-paced schedule to allow for unexpected events and avoid penalties. However, many of the participants faced with this choice opted to explicitly commit to staggered deadlines despite the potential for costly consequences if missed. Although this lack of flexibility could be potentially costly, those in the self-selected deadline condition identified more errors and had fewer late submissions (mean of approximately 8 days) than those in the end deadline condition. Indeed, the performance of

those who evenly or nearly evenly spaced the deadlines did not differ significantly from the participants who had externally imposed deadlines, suggesting that explicit, self-paced precommitments can help people avoid procrastination and complete longer term goals. Although people are tempted by immediately available choices, people may use self-paced, public commitments or deadlines as a self-control mechanism that allows them to more easily follow through and achieve more optimal outcomes.

Turning to an example that may be more familiar to those involved in treating SUDs, disulfiram therapy for alcohol use disorders can be conceptualized as a commitment-response strategy. Disulfiram (Antabuse) is a prescription medication that causes unpleasant reactions including palpitations, nausea, and headache within minutes of ingesting alcohol. Patients are informed of the risk of such reactions before initiating disulfiram therapy. As such, for those undergoing disulfiram therapy each ingestion of the medication is in essence a commitment to abstaining from alcohol for the next 1–2 weeks as the half-life of the medication is relatively long and consuming even a single drink risks experiencing quite an unpleasant reaction. Knowing that risk from the outset protects against preference reversals, although it certainly does not prevent them as there are instances of impulsive decisions to drink despite recent disulfiram ingestion. Nevertheless, supervised disulfiram can be highly efficacious when combined with strategies for supervising adherence to the medication regimen and is a helpful illustration of how commitment responses can be helpful (e.g., 50,51).

Having patients with SUDs make commitment responses around money is often a feature of efficacious behavioral treatments for SUDs. In the community reinforcement approach (CRA) to treating cocaine dependence (52), for example, patients are often assisted in arranging for direct deposit of their paychecks to decrease the likelihood of spontaneous decisions to use cocaine that are common when they have the paycheck in hand (e.g., 53,54). They are also assisted in making similar arrangements for tax returns or other transactions involving large sums of cash. As is discussed in more detail below, similar commitment responses are at the core of the ATM therapy (14–16). These are efforts to have patients make decisions from a temporal distance that decrease the likelihood of preference reversals.

Defaults and Preference for the Status Quo

Another bias discussed by behavioral economists is that of defaults and preference for the status quo. Many choices include a pre-identified default option that is implemented in the event that individuals fail to register a preference. A growing body of evidence demonstrates that when given a choice between staying with the default option and making an active response for an alternative option, people disproportionately choose to stay with the default (e.g., 55,56). This bias runs counter to classical economic theory that assumes the existence of individual preferences that, barring considerable costs in pursuing them, will be acted upon with the goal of optimizing longer term utility. The basic behavioral processes underpinning this bias for the default or status quo option remain to be fully elucidated, but at least two factors are likely involved. First, in at least some situations individuals may not have well-developed preferences regarding the available options and as such opt to stay with

what is easiest (i.e., the default option). Second, compared with the status quo the effort involved in making a transition from the default to an alternative is salient, the timing and magnitude of rewards associated with doing so often relatively ambiguous or delayed, and the risk for harm or loss greater in an unfamiliar context than familiar contexts. Each of those features could be expected to encourage staying with the status quo.

A seminal study on defaults examined their role in organ donation (57). In an online experiment, 161 respondents were asked whether they would be hypothetical organ donors with the default option varying across conditions. In the opt-in condition, they were asked to assume that they had just moved to a new state where the default was not to be an organ donor and asked to confirm or change that status. The second condition was identical to the first except that the default was to be a donor and participants were asked to confirm or change that status. In the third condition participants were simply asked to choose between the donor and no-donor options with no default involved. The form of the question in this study had a robust effect, with the percent consenting to donate organs being 82% and 79% for the conditions wherein they were donors unless they opted-out and the neutral choice arrangements, respectively, compared with only 42% in the condition where the default option was to non-donor status unless they actively opted-in (Figure 2).

Those results on hypothetical choices regarding organ donation were found to align quite nicely with a sort of natural experiment that these investigators also examined contrasting organ donation enrollment as a function of whether opt-in or opt-out defaults were in place across 11 European countries. The differences were again striking (Figure 3), with an average difference in the proportion of organ donors of approximately 60% between the four opt-in compared with the seven opt-out countries. Subsequent studies that analyzed other sources of population data and more thoroughly controlled for potential confounding by socioeconomic, religious, and organ donation infrastructure supported a robust contribution of the default arrangement (58,59).

In another experiment examining defaults in health-related decision making, 480 university employees were randomly assigned to one of two flu-shot conditions balancing conditions on sex and employment category (60). In the opt-out condition in this study, employees received an e-mail message notifying them that they had been scheduled for a flu-shot, with day, time, and location noted. In the opt-in condition, the comparable e-mail message explained about the availability of free flu-shots and provided a link to a website where they could make an appointment for a shot. The default option significantly influenced flu-shot adherence, with 45% of employees in the opt-out condition receiving shots compared with 33% in the opt-in condition, a 36% relative difference.

Where defaults around money management have received considerable attention is in the area of retirement savings accounts, especially regarding employee-defined contribution plans wherein employees can designate a percentage of their pretax earnings toward savings, often with an employer-matching contribution (61–65). An important factor influencing the utility of these plans at the time of retirement is how early employees enroll. The typical default option is opt-in where employees are excluded unless they make a response to enroll. While many complexities must be considered, the evidence suggests that opt-out strategies

can increase participation by 30–40% in the initial several years of employment, with those differences decreasing over time but remaining considerable throughout (62–64).

Helpful defaults in money management training among those with SUDs could be aimed toward encouraging the use of direct deposit rather than having to make active responses to deposit money each payday, automatic allocation of some portion of earnings to savings, automatic payout of selected bills each month, and so on. Closely examining the default options regarding not only money management but also other practices within agencies serving those with SUDs seems prudent in light of the aforementioned evidence and the relatively low response-cost involved on the part of the agency in structuring defaults to promote healthier choices. Thoughtful selection of defaults is a subtle but potentially powerful method for helping those with SUDs to make fiscally wiser and healthier choices.

Loss Aversion and the Endowment Effect

A number of systematic biases that contribute to suboptimal decision making were first highlighted by Kahneman and Tversky (66) in their seminal work on prospect theory in which they described how people evaluate changes in their utility or wealth and how these evaluations deviate from the rational actor assumptions of classical economics. A seminal observation that came out of this work was the concept of loss aversion, meaning that all else being equal the motivational impact of a loss of say \$100 is significantly greater than the impact of a gain of \$100. Loss aversion is invoked to explain a related phenomenon referred to as the endowment effect wherein the subjective value of a good increases once one has possession of the good.

The endowment effect is illustrated well using the university mug procedure wherein students in a university class are offered an opportunity to inspect an attractive coffee mug decorated with their university's logo. The mug is then given to alternating students so that half of the class members are mug owners and half are not. Next, the mug owners are asked to identify a selling price and those who did not receive a mug to name a price they would be willing pay to purchase a mug. Across a series of experiments involving different permutations of this basic procedure, students in possession of the mugs consistently set a sale price that is more than twice the value that students without a mug set as the price they were willing to spend to purchase the mug (67).

In a related experiment, students in three undergraduate classes were offered a choice between a coffee mug or a bar of Swiss chocolate. In one class students earned a university mug by completing a short questionnaire and then, at the end of the class, were shown a bar of Swiss chocolate for which they could evenly exchange for the mug. Students in the second class went through the same sequence of events except that they earned the chocolate bar and were given the option of trading it at the end of the class for the coffee mug. Students in the third class were simply given an upfront choice between the mug and the chocolate bar at the start of class. The results are quite striking in terms of supporting an endowment effect: 89% of the 76 students who originally earned the mug chose to keep it, 56% of the 55 students offered an upfront choice between the two options chose the mug, and only 10% of those who originally earned the chocolate bar opted to trade it for a mug (68). Clearly, the subjective value of the mug and chocolate bar was heavily influenced by

whether the students were already in possession of them. Being in possession of a good for even a short period of time appears to bring into play some fundamental biases that substantially alter its reinforcing effects relative to other commodities.¹

Recognizing this bias toward loss aversion has practical implications. For example, it suggests that people's choices should be influenced substantially by whether an outcome is framed as a gain or a loss (66,69–71). An often-cited example of how framing a choice option in terms of gains or losses can affect people's preferences is the Asian disease problem, in which people are told that an outbreak of a rare Asian disease is likely and is expected to kill 600 people (71). One group of people are told that if Program A is adopted, 200 people will be saved, whereas if Program B is adopted there is a one-third probability that 600 people will be saved and two-thirds probability that no one will be saved. In the case in which Program A was framed as a gain of 200 lives from the reference point of losing 600 lives, 72% of participants chose it. Conversely, presenting the identical outcome with a loss frame changed choices dramatically. In this latter scenario, Program A was framed as resulting in 400 people dying and Program B as a one-third probability that no one will die and a two-thirds probability that 600 will die. With the emphasis on the number of lives lost by choosing Program A, only 22% of participants chose that option. Despite the fact that no matter the wording, Program A always led to 200 people living and 400 dying, and Program B always resulted in one-third probability of 600 saved/0 dead and two-thirds probability of 0 saved/600 dead, the options chosen varied dramatically depending on whether the framing of Program A accentuated the gain or the loss.

Because of people's strong aversion to loss, framing decisions in terms of loss avoidance where appropriate should offer considerable advantage. There is likely to be advantage to helping patients with SUDs organize their finances so that losses associated with drug use are more salient, which they may not be in the typical chaotic lifestyle often associated with SUDs. It would also suggest potential advantage to framing money management practices in terms of steps toward protecting against further loss as the vast majority will enter treatment having already experienced considerable losses. Conceptually, it seems plausible that having patients with SUDs deposit their money in a savings or checking account where the amount accumulated is salient, and the practice socially reinforced by others, may leverage loss aversion against hasty decisions to spend the money on drugs compared with conditions where the money is kept haphazardly and there is no salient notation on the amount accumulated or associated opportunity for social reinforcement of the practice. That may be part of what the developers of the ATM intervention discussed below are looking to leverage.

If nothing else, loss aversion may provide a framework for understanding the resistance to change commonly exhibited by those in treatment for SUDs as well as other behavioral disorders. Humans appear to have a fundamental bias in the direction of overvaluing things in their possession. The studies discussed above illustrate this bias using material goods, but to the extent that it also holds for friends, activities, common practices and routines

¹Loss aversion may be related to the "sign effect" in delay discounting research wherein delayed losses are thought to be discounted less than gains of the same magnitude (41,42,88,89).

(including money management), places where one congregates, and so on, it could provide a powerful counterweight to efforts to promote behavior change based on a rational accounting of the costs and benefits of the drug-abusing versus a sober lifestyle. A related point for consideration is that to the extent that patients can be introduced to healthier substitutes for the familiar routines, this should lessen the perceived overall loss involved with the recommended therapeutic changes. For example, participation in self-help organizations; assistance with improving vocational opportunities; encouragement to explore religious and other sources of interpersonal fellowship; and starting new or reengaging with former exercise or sports regimens may all be helpful methods of reducing the perceived loss involved in giving up the drug-abusing lifestyle. Certainly these are all common elements of CRA and other behavioral therapies, appropriately conceptualized as putting patients in contact with alternative, substitute reinforcers for the drug-abusing lifestyle, but the practices can also be considered as lowering the net loss involved in discontinuing the familiar, well-practiced drug-abusing lifestyle.

Mental Accounting

Another systematic bias or practice that behavioral economists mention that is relevant to managing money is the tendency to make what are referred to as mental accounts in which one's money is categorized and treated differently depending on the source of the income, the category of expenditure, and how the money is spent (72). That is, people often group expenditures into categories (e.g., food, entertainment, vacation), and sometimes constrain their spending within categories according to an explicit or implicit budget for that particular category. In a study illustrating this strategy, for example, 66 MBA students were asked a series of questions about whether they would purchase a specific item (i.e., \$20 theater ticket) typical of a certain category (e.g., (entertainment) later in the week if earlier in the week they had (1) purchased a different specific item typical of that category (e.g., \$20 sporting event ticket); (2) received as a gift a specific item of that category (e.g., \$20-value sporting event ticket); or (3) incurred a cost or unexpected expense that was worth an amount equal to that of the other specific item but that came from a different category of expenditures (e.g., \$20 speeding ticket) (73). This study showed a strong effect of how expenditures varied depending on similarity of two expenses and whether they occupied the same category. For example, 33% of participants refused to purchase a \$20 boat tour or sports ticket if a purchase of a \$20 entertainment item came earlier in the week but were willing to purchase the items if the earlier purchase was free of cost or they had spent \$20 on a non-entertainment item. The controlling stimulus, if you will, appeared to be total money/purchases made within a category and not total money across categories.

Mental accounting can be construed as irrational or suboptimal decision making in that it treats a fully fungible good like money as though it is not. Of course, that can lead to fiscally suboptimal decisions like failing to pay down debt on high-interest loans. However, this bias toward mental accounting may also be helpful in protecting against impulsive decisions to consume drugs or engage in other unhealthy behaviors. That is, if developed in the direction of personal budgeting it can serve as a commitment response that protects against the bias for the present thereby facilitating saving for longer term goals such as paying the bills, saving for a downpayment on a house, vacations, and retirement.

Another factor that can be important to consider with regard to this mental accounting bias is that people often consider income differently depending on how the income was obtained. For example, unexpected windfall income may not function as part of the budget, and part or all of it may be used to make purchases that would not otherwise occur (74,75). That is, they may sometimes operate outside of the stimulus control that is central to the mental accounting strategy. A study of online grocery purchases investigated the effects of receiving a small windfall in the form of a \$10-off coupon (76). Rather than reducing spending, this small windfall resulted in an overall average spending increase of \$1.59, with the increased spending involving groceries the consumers did not typically purchase. The consequences of mental accounting can also be seen in the “house money” effect, in which gambling winnings are viewed as “free money,” and subsequent losses are viewed as reductions in gains, resulting in riskier choices (55,70,77,78). Bonuses may have a similar effect on spending, although they may be more likely to be integrated into the functional categories since they are often announced in advance (74).

Mental accounting research also predicts that larger windfalls or bonuses are more likely than smaller amounts to be saved or allocated to less frivolous purchases (74). This may be especially important to consider when working with individuals earning low incomes or receiving disability payments, where the relatively lower absolute amounts involved might ironically increase the likelihood of frivolous spending when extra money is received. That said, whether and how windfalls may increase frivolous spending is still debated, and other theories predict that bonuses are more likely to be saved than regular income. Experimental results on the topic are mixed (79,80).

Failure to Account for Opportunity Costs

Another systematic bias is a failure to consider opportunity cost when making choices. When a person is faced with a choice about whether to use their funds to purchase a particular commodity, they are facing two kinds of trade-offs:

- Good or Service X, available now, compared with all other commodities in the environment for purchase now (easier to compare and consider)
- Good or Service X, available now, compared with all possible goods or services available in the future (much more difficult to consider)

Ideally, a decision maker would carefully weigh not only the benefits of X, but also the opportunity cost, or the unrealized value, of not choosing all the other options available both in the present and in the future. In practice, people understandably often fail to consider the opportunity costs associated with purchases. In a study examining this issue, for example, 150 undergraduate students were asked to imagine they could purchase a DVD for \$14.99 and were given a buy option and one of two no buy options, worded as “not buy” meaning they would simply forgo the purchase without consideration of what might be done with the savings associated with doing so or alternatively “keep the \$14.99 for other purchases,” which obviously also entails forgoing the current purchase but makes explicit the opportunity to use the savings from doing so for a future purchase. While 75% of study participants opted for purchasing the DVD in the “not buy” condition, only 55% did so in the “keep the \$14.99 for other purchases” condition (81). Failing to consider opportunity

costs is especially likely when not all options are immediately available, when the options are ill-defined in number, or the consequences of the choices are delayed in time or probabilistic in likelihood of occurrence (81).

As this study on DVD purchases suggests, making opportunity cost more salient should help people make more optimal decisions. As another example, another study by these same investigators had study participants consider purchasing a standard cell phone or one that cost \$20 more. Half of the participants were requested to make a list of items they could purchase for \$20 prior to making the choice on cell phones while the other half of participants were not asked to make a list. Forty-seven percent (35/75) of participants in the condition involving the pre-choice list chose the less-expensive phone compared with only 30% (23/75) in the control group who were not asked to make a list (81). Similarly, in an online study using the delay discounting of hypothetical money paradigm, a general population sample of 112 participants were more likely to choose the delayed rather than immediate option if each option pointed out the amount available in the present and in the future, explicitly mentioning the “zero option” in each (82). That is, in the typical delay discounting arrangement a person is asked to choose, for example, either \$10 now or \$50 a year from now and will often opt for the smaller, sooner amount illustrating the bias for the present discussed above. However, if the options are reframed to show the usually hidden zero, that is, as choosing between \$10 today and \$0 in a year from now, or \$0 today and \$50 in a year, the likelihood of choosing the smaller, sooner option is significantly decreased; out of 15 choice pairs, participants in the explicit zero condition chose the smaller, sooner option over the larger, later reward significantly less than participants in the more typical “hidden zero” condition (6.1 ± 4.2 vs. 9.2 ± 3.2) (82).

Considered together, this series of studies illustrates how making the opportunity costs associated with the various options more salient in choice arrangements can significantly influence decision making. This is certainly a strategy that seems to have potential practical utility in working on money management skills among those with SUDs. Encouraging patients to track cost savings associated with sustaining abstinence, making explicit plans regarding other purchases that could be made with the savings, assisting them with opening savings accounts to manage the savings, or any other steps that might be taken to make more salient the opportunity costs of using substances and the potential alternative uses of those savings appear to have the potential to foster improvements in money management among those with SUDs.

EVIDENCE FROM TREATMENTS OF EFFECTIVENESS OF BEHAVIORAL ECONOMICS PRINCIPLES

Considering the type of biases discussed above can be useful in developing interventions for persons with SUDs. To illustrate that utility, we briefly review below two examples of interventions that leverage biases in decision making to improve outcomes. As noted above, the first example is voucher-based contingency management (CM) and represents a more general treatment intervention for SUDs rather than one having to do with money management per se (see Ref. (13) and the Dallery paper in this issue for more information on CM as a treatment approach). The other is a more recently developed intervention

designed explicitly for the purpose of increasing money management skills among dually diagnosed patients, namely, ATM therapy.

Voucher-Based Cm

In voucher-based CM patients earn vouchers exchangeable for retail items contingent on objective evidence of abstinence from recent drug use or some other therapeutic target (13,83,84). Voucher-based CM was originally developed as an efficacious component of a multi-element treatment for cocaine dependence and was subsequently extended to a wide range of other substances and subpopulations of patients with SUDs (for meta-analyses, see Refs. (85,86)). Several features of this treatment take advantage of the biases discussed above. First, the intervention accommodates the strong bias for the present (i.e., increased rates of hyperbolic discounting of delayed outcomes) common among persons with SUDs by reliably offering a material reinforcer immediately following objectively verified abstinence from recent drug use. The naturalistic reinforcers that result from abstinence from drug use are typically delayed in time and probabilistic (improvements in vocation, family life, and so on). Voucher-based CM also incorporates a punishment feature that may leverage loss aversion and the endowment effect. That is, patients receive a voucher each time they submit a drug-negative urine specimen or meet another therapeutic target, with the monetary value of the voucher earned increasing for each consecutive time they meet the reinforcement contingency. Importantly, should a participant submit a drug-positive sample or otherwise fail to meet the contingency, they not only forfeit that session's available payment, which can be considered a one-time loss, but their voucher payment schedule for the next drug-negative samples resets back to the original low value. This reset contingency has been experimentally demonstrated to decrease the likelihood of lapses back to drug use following a period of abstinence (87).

In addition to the schedule arrangement potentially leveraging loss aversion, the setup of the voucher program can also be used to help people break from the many suboptimal behaviors and commodities that may have become part of the patients' endowment or status quo. Many voucher-based CM programs require staff approval of voucher purchases, thereby providing staff the opportunity to help patients consider spending on goods and services that facilitate a healthy lifestyle. That was an important element of how the voucher program operated in the multi-element treatment for cocaine dependence mentioned above. Encouraging cocaine-dependent patients to use the funds for more appropriate sources of positive reinforcement can put patients into contact with classes of purchases that they may not have experienced otherwise, or at least for some considerable period of time, and hopefully increase the likelihood of similar purchasing in the future. Having actually experienced other reinforcing activities beyond drug use may also make more salient the opportunity costs associated with drug use. Finally, the voucher system presents an opportunity for patients and therapists to discuss and practice mental accounting/budgeting and to save for larger, later rewards, which in many instances may be a novel activity that hopefully brings them into contact with the larger magnitude reinforcement associated with doing so.

ATM Therapy

As noted above, Marc Rosen and colleagues have developed a new intervention, ATM therapy, for dually diagnosed patients (14–16). These patients often receive disability payments and commonly experience significant difficulty managing this limited income. ATM therapy seeks to reduce substance abuse in part by improving money management skills. ATM therapy encourages patients to store their funds with the study therapist; works with them to budget funds for goods or services other than substance abuse; regularly reviews budget adherence; and requires patients to submit breath and urine samples for verification of substance use or abstinence.

Two controlled, randomized clinical trials of ATM have been reported. In the first trial, 85 veterans with recent drug or alcohol use were assigned to ATM or to a control condition which consisted of completing a workbook on finances and budgeting (15). No significant differences on self-reported abstinence from alcohol or cocaine use or on urine toxicologies for cocaine metabolites were found, although Addiction Severity Index composite scores for alcohol and cocaine decreased more in the ATM group. The abstinence rates in both the ATM and control groups were quite high, so failure to see an effect of ATM on abstinence outcomes may have been due to a ceiling effect (15). The second trial included 90 patients who attended a community mental health clinic and also had a history of alcohol or cocaine abuse or dependence (16). Forty-seven participants were assigned to 36 weeks of ATM and 43 participants to a control condition ($n = 43$) in which patients received budgeting forms and help identifying income and expenses. Compared with the control group, patients in the ATM condition had more cocaine-negative urine toxicology test results; were more likely to be rated by their non-study clinician as being abstinent from illicit drugs; and reported spending less money on substances of abuse compared with control participants.

This treatment attempts to leverage several of the biases outlined above. In essence, ATM works to overcome self-control problems by asking people at a temporal distance from the allure of drug use to make a commitment response to abstaining from drug use. This commitment response contains several important elements: First, it removes immediate access to their own funds, thereby reducing or eliminating the likelihood of hasty decisions to make drug purchases (i.e., preference reversals). Second, as was discussed in the section “Mental Accounting,” having patients develop a budget can be thought of as a commitment to spending their money in the future on items judged desirable from a temporal distance. ATM does not preclude patients from accessing their funds. However, they have to see their therapist to access any money that they have deposited in the study bank account or to retrieve the checkbooks they have left with the therapist, which functionally inserts temporal delays between coming into contact with drug-associated stimuli that may occasion a preference reversal and the opportunity to make a drug purchase. It also increases response effort (i.e., price) involved in obtaining the drug – actual dollar price plus the extra effort to obtain the funds to make the purchase. Finally, the simple act of working with the therapist to develop and monitor a budget on a weekly basis may help patients establish some degree of stimulus control over their purchasing behavior where there was none; help them identify new or better options to purchase; and help them engage in behavior (e.g., record keeping, balancing checkbooks) that makes expenditures and savings more salient. In addition, the

therapist can help patients identify instances or types of situations where mental accounting may be leading to suboptimal choices, such as when a windfall payment occurs, so that they might avoid the pitfalls of making frivolous or harmful purchases rather than allocating it to meet their more pressing needs.

SUMMARY AND CONCLUSIONS

Research in behavioral economics has identified systematic biases in how humans make choices that may be directly relevant to understanding common difficulties in money management generally. Our goal in outlining them in this article, of course, was that they may be useful in contemplating likely problems with promoting effective money management among those with SUDs and the dually diagnosed and hopefully suggest some possible practical strategies for improving skill deficits in these populations. Ultimately, judgment on the utility of these behavioral economics observations for those purposes is an empirical question. There has been little research explicitly examining some of these biases among individuals with SUDs, although there is every reason to anticipate that they are operating. The CM and ATM treatments that we discussed illustrate the potential of leveraging behavioral economics principles in efforts to promote behavior change among patients with SUDs. We anticipate that there is potential for many additional fruitful applications as well and eagerly await their arrival.

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FIGURE 1.

The present subjective value of reinforcing outcomes at a range of delays from the actual delivery of the outcome. The dark bars represent the actual value of the outcome at the time it is received. (A) The subjective value of \$1000 received at a range of delays, with the subjective value increasing as the time to delivery gets closer. (B) The smaller, sooner reinforcing consequences associated with drinking at a wedding and the larger, later reinforcing consequences of abstaining from alcohol. The subjective value of abstaining is larger than that of drinking 1 week before drinks are available, but this preference reverses

at the time of the wedding so that the smaller, sooner outcome of drinking alcoholic beverages has a higher subjective value than does abstaining. All data are hypothetical and assume the hyperbolic discounting model (22).

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FIGURE 2.

Percentage of study participants consenting to be hypothetical organ donors as a function of whether the opportunity to do so was structured with the default option being to donate (i.e., opt-out), refrain from donating (opt-in), or the default option was omitted and participants simply indicated whether they wished to donate. Reprinted with permission from Ref. (57).

FIGURE 3.

Percentage of eligible citizens consenting to donate organs as a function of whether the countries used an opt-out (seven countries represented by dark bars) or opt-in (four countries represented by light bars) consent practice. Reprinted with permission from Ref. (57).