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The Gist of Delay of Gratification: Understanding and Predicting Problem Behaviors

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Abstract

Delay of gratification captures elements of temptation and self-denial that characterize real-life problems with money and other problem behaviors such as unhealthy risk taking. According to fuzzy-trace theory, decision makers mentally represent social values such as delay of gratification in a coarse but meaningful form of memory called “gist.” Applying this theory, we developed a gist measure of delay of gratification that does not involve quantitative trade-offs (as delay discounting does) and hypothesize that this construct explains unique variance beyond sensation seeking and inhibition in accounting for problem behaviors. Across four studies, we examine this Delay-of-gratification Gist Scale by using principal components analyses and evaluating convergent and divergent validity with other potentially related scales such as Future Orientation, Propensity to Plan, Time Perspectives Inventory, Spendthrift-Tightwad, Sensation Seeking, Cognitive Reflection, Barratt Impulsiveness, and the Monetary Choice Questionnaire (delay discounting). The new 12-item measure captured a single dimension of delay of gratification, correlated as predicted with other scales, but accounted for unique variance in predicting such outcomes as overdrawing bank accounts, substance abuse, and overall subjective well-being. Results support a theoretical distinction between reward-related approach motivation, including sensation seeking, and inhibitory faculties, including cognitive reflection. However, individuals’ agreement with the qualitative gist of delay of gratification, as expressed in many cultural traditions, could not be reduced to such dualist distinctions nor to quantitative conceptions of delay discounting, shedding light on mechanisms of self-control and risk taking.

Keywords

risk taking; delay discounting; inhibition; fuzzy-trace theory; self-control; sensation seeking; substance use; impulsivity

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INTRODUCTION

The ability to wait for larger delayed rewards, while resisting smaller immediate ones, predicts academic, social, and health outcomes (Zayas, Mischel, & Pandey, 2014). This ability has been assessed in the delay-of-gratification “marshmallow” task in which many children who resolve to wait for two treats nevertheless succumb to the temptation to eat just one (Duckworth, Tsukayama, & Kirby, 2013). For adults, researchers use money rather than marshmallows as a common reward. By varying amounts and timing of sooner smaller rewards versus larger later ones, individuals’ choices can be used to estimate the rate at which they discount money over time (Fehr, 2002). Like delay of gratification, these discount rates derived from choices made in the laboratory also predict important life outcomes (e.g., Chabris, Laibson, Morris, Schuldt, & Taubinsky, 2008).

Despite the superficial similarity between delay-of-gratification and delay-discounting tasks, it is not clear that they measure the same thing. For example, delay of gratification is typically measured as time spent *waiting* for the larger reward as distinct from preference for it, whereas delay discounting is typically measured as time *preference* or the degree to which later rewards are preferred to sooner ones (Frederick, Loewenstein, & O’Donoghue, 2002). In particular, theories of delay discounting traditionally represent time preferences as continuous trade-offs between varying quantities of time and money (for a review, see Doyle, 2013). Delay-of-gratification tasks measure the ability to sustain an initial choice, while delay-discounting tasks measure a series of choices (Reynolds & Schiffbauer, 2005). Thus, resisting temptations in the present in order to achieve rewards in the future (delay of gratification) may differ from time preferences that reflect the degree to which the magnitude of a delayed reward compensates for the magnitude of its delay (delay discounting; e.g., Dai, Milkman, & Riis, 2014; Prelec & Loewenstein, 1998; Zimbardo & Boyd, 1999). Specifically, a goal of our research is to distinguish between *qualitative thinking* about delay of gratification and *quantitative thinking* about time trade-offs as in delay discounting.

Thinking about delay of gratification is shaped by social and cultural influences, as illustrated in Aesop’s fable “*The Ant and the Grasshopper*”—in which the ant toils to store food through the summer to eat in the winter while the grasshopper enjoys himself in the summer and then is hungry in the winter—and the Sesotho proverb “*Lepotla-potla le ja poli; lesisitheho le ja khomo*” (The “hurry-hurry” person eats goat; the one who takes his or her time eats beef; Webley & Nyhus, 2006). These social and cultural influences can encourage delay of gratification, as in the traditional protestant ethic or Calvinism, or discourage it, as expressed in the poetry of carpe diem (Weber, 1930).¹ Hence, internalizing such social values can augment mechanisms of self-control and, theoretically, reduce problem behaviors that reflect control failures (e.g., unprotected sex or underage drinking in response to peer pressure; Reyna et al., 2013).

¹Robert Herrick’s (1591–1634) “To the Virgins, to Make Much of Time”: Gather ye rosebuds while ye may, Old Time is still a-flying; And this same flower that smiles today Tomorrow will be dying. The glorious lamp of heaven, the sun, The higher he’s a-getting, The sooner will his race be run, And nearer he’s to setting. That age is best which is the first, When youth and blood are warmer; But being spent, the worse, and worst Times still succeed the former. Then be not coy, but use your time, And while ye may, go marry; For having lost but once your prime, You may forever tarry.

However, delays that are relevant to self-control problems are often longer than the minutes children spend waiting for marshmallows (Nielsen & Phillips, 2008). For example, borrowing money or engaging in higher education plays out over months and years, rather than minutes. Many adults, even those with self-control problems, can wait a few minutes on a single occasion for a greater reward, but they cannot sustain delay of gratification over longer periods (Kouchaki & Smith, 2014). Tasks such as go/no-go can be used with adults to measure self-control (Aron & Poldrack, 2005), but they usually involve withholding prepotent motor responses for brief periods of time. Moreover, these tasks lack the elements of temptation and self-denial that characterize real-life delay-of-gratification problems with money, food, sex, and other rewards (DeYoung, 2010). For example, most go/no-go tasks involve numbers, letters, or shapes (Casey, Jones, & Hare, 2008; Schulz et al., 2007; but see Casey et al., 2011).

Therefore, assessments of delay of gratification are needed that capture these theoretical constructs and are reliable, valid, do not duplicate time preference or other measures, and are suitable for adults. These assessments should ideally reflect theoretical mechanisms that are evidence-based. Here, we exploit research on memory representations of core values—called gist principles—that have been shown to guide decision making in multiple domains (e.g., Broniatowski, Klein, & Reyna, 2015; Fraenkel et al., 2012, 2015; Mills, Reyna, & Estrada, 2008; Reyna & Mills, 2014; Wolfe et al., 2015; for overviews, see Reyna, 2012; Reyna & Brainerd, 2011).

According to fuzzy-trace theory, which is supported by experimental evidence and mathematical models, people mentally represent their core values in the form of vague or fuzzy long-term memories, such as “I have a responsibility to my partner to not put him/her at risk” in the context of sexual risk taking; “It is important to accept the risk of side effects now in order to improve my chances of being healthy in the future” in the context of medication adherence; and “Better safe than sorry” in these and other contexts (Fraenkel et al., 2012; Mills et al., 2008; Reyna & Mills, 2014; Wolfe et al., 2015). Applied to the delay of gratification, such a principle might be “I believe in sacrifice now, enjoy later,” used in the present studies. Gist principles are not mindless memorized rules that apply universally but instead are fuzzy guidelines that are evoked depending on meaningful cues in context (Reyna, 2012).

Fuzzy-trace theory also predicts that, as development progresses and people gain experience, they are more likely to base their decisions on simple gist principles as opposed to more precise mental representations of values (Reyna, Chick, Corbin, & Hsia, 2014; Reyna & Farley, 2006; Reyna & Lloyd, 2006; Reyna et al., 2011). Gist representations of decision options and of social and moral principles fit together like a lock and key with respect to memory retrieval: When people focus on the simple gist representations of their options, they are better able to retrieve relevant social and moral values (stored in long-term memory also in a gist form) and, thus, successfully apply them to decisions (Fujita & Han, 2009). Gist representations have also been shown to endure over time, to be easier to mentally manipulate, and to be less subject to interference (e.g., from high arousal or emotion)—all of which should help decision makers sustain resistance to impulsive urges (e.g., Rivers, Reyna, & Mills, 2008). Finally, gist representations reflect a construal or interpretation of

decision options, for example, as being about sacrifice and what that signifies culturally, that may reduce arousal and, consequently, impulsivity (much like thinking about a marshmallow as a cloud, rather than a candy, reduces arousal).

Thus, all other factors equal, a gist-processing preference should decrease unhealthy risk taking and generally promote better decision making (Fukukura, Ferguson, & Fujita, 2013; Mills et al., 2008; Reyna & Mills, 2014). Rather than trading off risks and rewards, which encourages risk taking when benefits are high and negative consequences are rare, gist-based thinking encourages categorical avoidance of catastrophic consequences, such as HIV infection (e.g., Reyna et al., 2011). Gist-based categorical thinking focuses on the qualitative meaning or bottom line of decision options, in parallel with precise verbatim thinking about perceived risks and rewards. For adults as opposed to adolescents or for experts as opposed to novices, insightful gist has demonstrated advantages for decision makers compared with literal verbatim thinking (e.g., Reyna & Lloyd, 2006; Wolfe et al., 2015).

Naturally, the gist or bottom line of some risks is that they are healthy (e.g., going for the gold in the Olympics by choosing a challenging routine), as are some immediate pleasures (e.g., taking a break from studying to relax and have fun), and should not be avoided. Nevertheless, analogous to predictions for risk preferences (e.g., Kühberger & Tanner, 2010; Reyna et al., 2014), fuzzy-trace theory characterizes advanced thinking about delay of gratification not as trading off exact quantities of rewards against exact quantities of time (e.g. \$18 now vs. \$30 in a month) but as understanding the simple bottom line of core values and how they apply to decisions (e.g., “sacrifice now, enjoy later”; for similar approaches, see Fujita, 2011; Fujita & Han, 2009; Magen, Kim, Dweck, Gross, & McClure, 2014; Venkatraman, Payne, Bettman, Luce, & Huettel, 2009). As life outcomes data suggest, the gist of many decisions about health and wealth is that it is better to sacrifice in the short term in order to enjoy large rewards in the long term.

Thus, consistent with prior gist-principles scales, we constructed a scale of simple values related to delay of gratification (e.g., Broniatowski et al., 2015; Fraenkel et al., 2012, 2015; Reyna, 2008; Reyna et al., 2011; Reyna & Mills, 2014). We used money as a “common currency” to tap reward sensitivity (Levy & Glimcher, 2012), but, as we test in the second and third studies, we expected that these principles apply beyond problems with money to other problem behaviors. The principles ranged from *carpe diem* (“I spend money on having fun today and don’t worry about tomorrow”) to self-denial associated with many religious and cultural traditions (“I believe in sacrifice now, enjoy later”). Having reviewed the literature on delay of gratification, these principles were not found on existing measures of this construct, and new scale items were written to fill this gap. As such, this scale is not designed to replace other instruments that measure delay discounting or future orientation but to complement these constructs. Although items on our scale might resemble a few items from the Barratt Impulsiveness Scale (e.g., “I buy things on impulse” (Patton, Stanford, & Barratt, 1995), the remaining items do not; nonetheless, we evaluate whether the scales are correlated. Our point is not that impulsivity fails to predict outcomes—it certainly does—but that impulsivity and delay of gratification as we define it are not the same construct.

The Delay-of-gratification Gist Scale was designed to be gender neutral because it does not specify the objects of spending or saving, and it can be used with young adults because it does not refer to investments such as stocks or bonds that are usually purchased later in life. The scale also does not depend on specific dollar amounts or delay periods that can shift in value across time and circumstances. This robustness to gender, financial instruments, or specific amounts is a consequence of the generality and, hence, broader utility of gist representations (Reyna, Hans, Corbin, Yeh, Lin, & Royer, 2015).

We begin by examining the reliability and coherence of the Delay-of-gratification Gist Scale (DG-Gist) in each of three studies with large samples by subjecting the scale items to principal components analyses. Then, again for these three studies plus another smaller community sample, we report correlations of DG-Gist scores with other potentially related scales, such as Future Orientation (Webley & Nyhus, 2006), Propensity to Plan (Lynch, Netemeyer, Spiller, & Zammit, 2010), Time Perspectives Inventory (Morsanyi & Fogarasi, 2014; Zimbardo & Boyd, 1999, 2008), Spendthrift-Tightwad (Rick, Cryder, & Loewenstein, 2008), Barratt Impulsiveness (Patton et al., 1995), and delay discounting using the Monetary Choice Questionnaire because it has high test–retest reliability over a year for the target population of college students (Kirby, 2009). Each of these measures has been shown to be associated with real-world outcomes and behavioral measures such as saving and spending money, Fair Isaac Company (FICO) credit scores, grade point average, and credit card debt. The aim of these correlations is to determine whether DG-Gist merely recapitulates existing measures and to demonstrate the validity of the scale in predicting self-reported behavioral outcomes.

Subsequently, using regression analyses, we evaluate the predictive validity of DG-Gist along with other predictors for financial problems (and potential problems) in Study 1 and for risky problem behaviors in Studies 2, 3, and 4. We test the hypothesis that risky problem behaviors sometimes reflect lower levels of delay of gratification. For example, taking illegal drugs involves immediate pleasure, but it can interfere with long-term educational and career goals. Problem behaviors have multiple causes, including failure to inhibit impulses, sensitivity to reward, and inability to sacrifice now for greater reward later (Reyna & Farley, 2006). Analogous to a marshmallow task for adults, we predict that DG-Gist captures the latter construct and that people who score highly on it will also exhibit more problem behaviors, much in the way that the marshmallow task for children predicts educational achievement, drug use, and health later in life (Mischel et al., 2010). Therefore, in Study 1, predictive validity of DG-Gist is compared with alternative predictors associated with poor financial outcomes in prior literature, such as high discounting rates, being a spendthrift, and low numeracy (inability to understand and use numbers) (e.g., Ghazal, Cokely, & Garcia-Retamero, 2014; Lusardi, 2012; Peters & Bjalkbring, 2015; see below). In Studies 2, 3, and 4, DG-Gist is again compared with delay discounting but not as a predictor of monetary outcomes. Instead, DG-Gist is related to self-reported risky behavior (e.g., unprotected sex and drinking and driving; Gullone, Moore, Moss, & Boyd, 2000) as well as alcohol use and dependency (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). In each study, the main hypothesis is that DG-Gist will predict problem behaviors beyond reward-related approach motivation, including sensation seeking, and other inhibitory faculties, including cognitive

reflection (e.g., DeYoung, 2010; Ernst, Pine, & Hardin, 2006; Frederick, 2005; Toplak, West, & Stanovich, 2011).

METHOD

Study 1

Participants were 211 college students with a mean age of 20.26 years ($SD = 1.6$). The sample was 69.2% women, 60.1% White, 4.9% African American, 28.7% Asian, and 6.3% mixed or other; 8.9% identified as Hispanic. They participated in exchange for course credit.

After providing consent, participants responded to a 12-item DG-Gist Scale using a 5-Point Likert Scale that ranged from strongly disagree to strongly agree (see Table 1 for items). Six items favored delay of gratification, and six did not (the latter were reverse scored). Order of presentation of items was randomized. In addition to the DG-Gist, participants responded to eight types of scales that were alternative predictors of financial problems (Table 2).

The Future Orientation Scale (Webley & Nyhus, 2006) contains 10 items that assess whether people consider future consequences of actions rather than merely immediate consequences (e.g., “I think about how things can change in the future, and try to influence those things in my everyday life”). Webley and Nyhus showed that future orientation correlated with conscientiousness (as many time perspective scales do) and with retrospective reports of economic socialization (being encouraged to have a bank account as a child, having earned or been given money as a teenager, having discussed financial affairs with parents). Those who were future oriented smoked and drank less, as well as had higher savings (see also Strathman, Gleicher, Boninger, & Edwards, 1994).

The Propensity to Plan Scale (Lynch et al., 2010) is similar in comparing consideration of immediate and distant consequences, but it distinguishes four subscales, two of which assess the extent to which people plan regarding their money and two the extent to which they plan regarding their time. This results in *short-run money*, *short-run time*, *long-run money*, and *long-run time* subscales, each with six items. The long-run money subscale has been found to be predictive of Fair Isaac Company (FICO) credit scores.

The Attitudes to Debt Scale (Lea, Webley, & Walker, 1995) is a 17-item measure that assesses perceptions of debt, which range from viewing credit and loans as “basically wrong” to acceptance of debt as a part of a modern consumer society. Scores on this scale have been found to predict amount of personal debt, although not consistently across samples.

The Material Values Scale (Richins, 2004) contains 18 items divided into 3 subscales, each of which is associated with an aspect of materialism in consumer habits. These three subscales are *success*, representing the importance of material possessions as an indicator of success; *centrality*, measuring the importance of these possessions generally; and *happiness*, concerning the importance of possessions to one’s subjective well-being.

The Zimbardo Time Perspective Inventory (ZTPI; Zimbardo & Boyd, 1999) is a 56-item measure consisting of five distinct factors: The *past-negative* factor measures an aversive

view of the past, as a result of either experience or reconstruction. The *present-hedonistic* factor assesses orientation to present pleasures with little concern for future consequences. The general *future* factor assesses a general attitude toward planning and striving for goals and rewards. The *past-positive* factor measures pleasure and nostalgia associated with the past, and the *present-fatalistic* factor consists of items that illustrate a helpless and hopeless attitude toward life and future planning.

The Spendthrift-Tightwad is a four-item scale that assesses spending habits that result from experiencing too little (spendthrifts) or too much (tightwads) pain associated with paying (Rick et al., 2008). Rick et al. demonstrated, with a sample of over 13 000 consumers, that individual differences on this scale predicted savings and credit card debt but were unrelated to income.

Delay discounting was assessed using the Monetary Choice Questionnaire (MCQ; Kirby, 2009). This questionnaire contains 27 delay discounting choices, for example, “Would you prefer (a) \$34 today or (b) \$35 in 186 days?” The questions vary in the amount offered today, the amount offered after a delay, and the length of the delay. From these choices, a hyperbolic discount rate (k) was calculated, and such rates have been found to be stable over 1 year. Other measures, such as number of delayed choices or taking the log of k , produced similar results.

The Lipkus Objective Numeracy Scale (Lipkus, Samsa, & Rimer, 2001) is an 11-item performance measure that assesses mathematical abilities such as multiplying, proportional reasoning, and understanding relative magnitude. The scale has been found to predict financial and health outcomes (Liberali, Reyna, Furlan, Stein, & Pardo, 2012; Reyna, Nelson, Han, & Dieckmann, 2009). For example, one of the questions is “Which of the following numbers represents the biggest risk of getting a disease? (a) 1 in 100, (b) 1 in 1000, (c) 1 in 10.”

Financial problem behaviors were assessed using seven questions plus an allocation task (Table 3): Three of these were multiple-choice questions that assessed frequency of savings (choices ranged from never to every month), of overdrawing bank accounts (choices ranged from never to several times a month), and of paying only the minimum on credit cards (choices ranged from never to every month). Another multiple-choice question asked how much of the credit card bill was paid each month, with choices ranging from “I always pay the minimum” to “I pay it in full every month.” The remaining three questions asked for the current dollar value of debt from credit cards, student loans, and automobile loans.

Although these seven items were not independent of one another, they did not form a unidimensional scale. Aggregating all seven items or subsets of similar items (e.g., questions about debt) produced fewer significant effects. Thus, the items are analyzed separately. Participants could indicate that they did not have a credit card or bank account that they were responsible for and such respondents were excluded from analyses for that item (103 participants, or 49% of the sample, were included in the analyses of credit card payments).

An allocation task was used to avoid effects of current wealth. Participants were asked what they would do if given a \$1000 and offered eight options (including “Other” that they could

fill in) ranging from “Spend immediately (on entertainment, a vacation, or other fun activities)” to “Put it in a savings account.” Dollar values were recorded for each response category, and all categories were required to total \$1000. Almost none of the participants selected two of the options (invest in stocks or invest in bonds), so these are not considered further.

Two questions were used to assess subjective well-being (SWB). First, the question “All things considered, how satisfied are you with your life as a whole these days?” was taken from the World Values Survey (Delhey, 2009) and could be answered with a 5-Point Likert Scale ranging from “very dissatisfied” to “very satisfied.” Second, participants were asked a question from the General Social Survey (e.g., Kahneman, Krueger, Schkade, Schwarz, & Stone, 2006): “Taken all together, how would you say things are these days—would you say that you are very happy, pretty happy, or not too happy?,” also scored ordinally.

Participants also completed an aggregate measure of socioeconomic status (SES; $\alpha = .689$) consisting of questions regarding level of parental education and whether they had ever received a free lunch at school (mean = 3.61; $SD = .681$).

Study 2

Participants were 845 college students with a mean age of 19.92 years ($SD = 1.26$). After providing consent, they completed the scales described below as part of an unrelated experiment. The sample was 68% women, 63.7% White, 4.8% African American, 30.3% Asian, and 1.2% mixed or others; 10% of the sample identified as Hispanic. They participated in exchange for course credit.

In addition to the DG-Gist as in Study 1, participants received the Brief Sensation Seeking Scale (BSSS; Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002), and the Cognitive Reflection Test (CRT; Frederick, 2005), and, as criterion (or outcome) variables, the Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001) and the Adolescent Risk Questionnaire (ARQ; Gullone et al., 2000).

The BSSS contains eight items (responses ranged from *strongly disagree*, 1, to *strongly agree*, 5) and is an adaptation of earlier scales by Zuckerman and colleagues (Zuckerman, 2007; Zuckerman, Eysenck, & Eysenck, 1978). The four sub-scales in the BSSS include experience seeking (e.g., “I would like to explore strange places”), boredom susceptibility (e.g., “I get restless when I spend too much time at home”), disinhibition (e.g., “I like wild parties”), and thrill and adventure seeking (e.g., “I like to do frightening things”).

The Cognitive Reflection Test is a three-question performance test in which each item is designed to induce an intuitive response that must be monitored and inhibited for correct performance (Frederick, 2005; Toplak et al., 2011). For example, when asked, “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 frequent incorrect answer is “ten cents.” Based on “verbal reports and scribbles in the margin” (Frederick, 2005, p. 27), those who answer correctly (“five cents”) typically consider the intuitive response first but then over-ride it (see also Liberali et al., 2012).

The AUDIT is a 10-item survey of recent alcohol use, alcohol dependence, and alcohol-related problems (Babor et al., 2001). Scores for each item range from 0 (e.g., *never*) to 4 (e.g., *daily or almost daily*), yielding totals from 0 to 40 with higher values indicating greater likelihood of disorder. The scale was developed and evaluated over two decades, and it has been found to provide an accurate measure of alcohol-related risk across gender, age, and cultures. Two out of three college students engage in binge drinking, and one out of five may be diagnosable with alcohol use disorders (National Institute on Alcohol Abuse and Alcoholism, 2015). Alcohol consumption is a leading cause of death among young adults, with college students at higher risk than same-aged comparison groups (Reyna et al., 2013), and dependence peaks between 18 and 20 years old (as defined by the American Psychiatric Association, see Masten, Faden, Zucker, & Spear, 2008; Wechsler & Nelson, 2001).

The ARQ is a wide-ranging measure of participation in risky behaviors (Gullone et al., 2000), normed on a large sample of 970 adolescents. Respondents indicate how often (i.e., never, hardly ever, sometimes, often, very often scored from 1 to 5) they have engaged in 22 activities, such as drinking and driving, driving without a license, having unprotected sex, and taking drugs (see also Berns, Moore, & Capra, 2009). Risky behaviors elevate preventable death, disease, and injury in adolescents and young adults (IOM (Institute of Medicine) and NRC (National Research Council), 2011).

Study 3

Participants were 393 college students with a mean age of 19.50 years ($SD = 3.55$). After providing consent, they completed the DG-Gist, BSSS, CRT, MCQ, AUDIT, and ARQ as part of an unrelated experiment. The sample was 71% women, 62.4% White, 7.5% African American, 23.1% Asian, and 7% mixed or other race; 8.4% of the sample identified as Hispanic. They participated in exchange for course credit.

Study 4

Participants were 47 adolescents and adults who were recruited from the local community through fliers and newsletter advertisements to participate in an unrelated experiment for which they were compensated for their time. Their age ranged from 14 to 49 years, with a mean age of 27.26 ($SD = 9.962$); 62% were female. The sample was 87% White, 4% African American, 4% Asian, 4% mixed or other race; 13% of the sample identified as Hispanic. This sample also completed the SES measure described in Study 1 ($\alpha = .621$), and the mean SES was 3.19 ($SD = .84$). In addition to the DG-Gist Scale, participants completed the Barratt Impulsiveness Scale (BIS-11) as well as the AUDIT and ARQ. The BIS-11 is a 30-item self-report instrument that has been described as “the most commonly administered self-report measure for the assessment of impulsiveness in both research and clinical settings” (p. 385; Stanford et al., 2009). Ratings were made using a 1–4 scales as follows: (1) *rarely/never*; (2) *occasionally*; (3) *often*; and (4) *almost always*.

RESULTS AND DISCUSSION

Reliability and dimensions of the Delay-of-gratification-Gist Scale

Combining the three large samples, the overall Cronbach's α for the DG-Gist Scale was .802 (for reliabilities in each sample, see Table 2). A histogram of mean scores for the college samples can be found in Figure 1. The DG-Gist Scale's skewness was .467 ($SE = .064$). Kurtosis distributions were also all within the limits of a normal distribution with .319 ($SE = .128$). DG-Gist scores for men and women did not differ significantly.

To determine the underlying dimensional structure of the DG-Gist Scale, a principal components analysis of the 12 items was conducted for each of the three large samples (Studies, 1, 2 and 3). Table 1 displays the oblique solution with factor loadings on each dimension. Highly similar solutions are obtained regardless of the method used for selecting dimensions (e.g., conventional methods using eigenvalues greater than 1.0 or Velicer's minimum average partial, MAP, test; O'Connor, 2000; Velicer, 1976; Velicer, Eaton, & Fava, 2000).

As Table 1 shows, using conventional methods, the majority of items loaded on the initial dimension in all three samples: 10/12 (Study 1), 12/12 (Study 2), and 11/12 (Study 3). Across the studies, that first dimension is perhaps best described by the item, "I think it is better to go without something I want until I can afford to pay for it." There is some suggestion of additional borrowing/owing and saving/spending dimensions (see also Appendix for orthogonal analyses). However, reliability of the overall scale (impressive for a short scale) is not increased appreciably by eliminating any item (Table S1 shows means, corrected item-total correlations, and alphas with each item deleted). Consistent with the conventional results across the three studies for the principal component analyses, MAP tests determined a single component underlying the DG-Gist Scale (O'Connor, 2000). This single component was found in all three studies using both the original test (Velicer, 1976) and revised test (Velicer et al., 2000). Given these results, we used the entire scale mean for subsequent analyses.

Correlations between delay-of-gratification-gist and other predictors

As shown in Table 2, most of the alternative predictors had good to excellent reliability. (Reliabilities of alternative scales were generally similar to those found in other publications, although a few were higher and lower; see Hoyle et al., 2002; Liberali et al., 2012; Richins, 2004; Rick et al., 2008; Steinberg et al., 2009). Thus, it makes sense to examine correlations between DG-Gist and these potentially related scales, also shown in Table 2. Spearman's rho correlations are reported, as the underlying psychological variables of each scale are assumed to be ordinal (Pearson correlations were highly similar). In Study 1, DG-Gist was positively associated with other constructs related to planning and the future but negatively related to constructs related to present-mindedness, materialism, attitude to debt, and being a spendthrift (i.e., tending in the direction of being a spendthrift as opposed to a tightwad). Such a pattern is consistent with convergent validity. However, the correlations ranged from small to fair, and none of them is of sufficient magnitude to suggest that DG-Gist measures a construct that is identical to previous constructs.

In Studies 2 and 3, DG-Gist demonstrated significant negative relationships with sensation seeking and positive relationships with cognitive reflection, consistent with the construct of delay of gratification (Table 2). DG-Gist correlated with each subscale of BSSS in Study 2 and two of the four subscales in Study 3. That is, in Study 2, DG-Gist correlated with the *experience-seeking* subscale, $\rho(843) = -.109$ ($p < .01$), the *boredom* subscale, $\rho(843) = -.237$ ($p < .01$), the *thrill-seeking* subscale, $\rho(843) = -.161$ ($p < .01$), and the *disinhibition* subscale $\rho(843) = -.241$ ($p < .01$). In Study 3, DG-Gist correlated with the *boredom* subscale, $\rho(843) = -.144$ ($p < .01$), and the *disinhibition* subscale $\rho(843) = -.268$ ($p < .01$). These correlations with DG-Gist were obtained although neither sensation seeking (BSSS) nor cognitive reflection (CRT) concerns money. Delay discounting (time preference) as measured by the MCQ was not correlated with DG-Gist in Study 1 but weakly negatively correlated in Study 3 (Table 2). In Study 4, DG-Gist correlated with Barratt Impulsiveness (Table 2). As in Study 1, none of the correlations in Studies 2, 3, or 4 were of sufficient magnitude to suggest that DG-Gist measures a construct that is identical to previous constructs.

Predictions of self-reported problem behaviors

The main goals of the following analyses are to determine whether DG-Gist is (i) a predictor of self-reported problem behaviors and (ii) a unique predictor of those behaviors once other predictors are accounted for. Because some predictors are correlated with DG-Gist, we first report bivariate correlations between each predictor and each problem behavior. Spearman correlations are reported here, as the outcome variables are all single ordinal items (although Pearson correlations were highly consistent). The bivariate analyses allow a clear picture of relationships between predictors and outcomes without issues of multicollinearity or suppressor variables that are possible in multiple regression analyses. Multiple regression analyses are reported after the initial bivariate analyses.

Bivariate correlations with problem behaviors

In Study 1, all of the nine types of scales predicted at least one of the 14 outcomes—12 financial and 2 SWB measures. Most scales (e.g., Future Orientation, Propensity to Plan, Attitude to Debt, Material Values, and Time Perspective Inventory) predicted two or three outcomes (Appendix). Several of these findings are worth underlining: Propensity to Plan was associated with greater frequency of savings and student loan debt (arguably an investment in future income), but a more permissive Attitude to Debt was associated with greater credit card debt. Paradoxically, Future Orientation was associated with both more frequent savings and more credit card debt. More sensibly, as indexed by the Time Perspective Inventory, negative emotions about the past or present were inversely correlated with life satisfaction and happiness, whereas positive emotions were positively correlated with those same SWB outcomes. Those who valued money more as a sign of success allocated more money to immediate spending. Ironically, the more strongly respondents identified material possessions as a source of happiness, the less happiness they reported (Appendix).

In contrast, DG-Gist predicted eight outcomes in Study 1 (Table 3): Those higher in DG-Gist were less likely to pay the minimum credit card bill and more likely to pay in full, less

likely to overdraw their bank account, saved money more frequently, had less credit card debt, allocated less money to spending immediately and more to savings, and were more satisfied with their life as a whole. Note that the allocation task was intended to avoid effects of current wealth. We also controlled for SES in regression analyses (see succeeding text).

The Spendthrift-Tightwad Scale successfully predicted three outcomes in Study 1: Spendthrifts saved money less frequently, allocated more to spending immediately, and reported less overall happiness. A higher discounting rate (as measured by the MCQ) predicted allocating more money to spending immediately, and several other effects of MCQ were similar to DG-Gist but missed significance. Consistent with prior research on financial literacy, those higher in numeracy were also less likely to pay the minimum credit card bill, more likely to pay in full, and less likely to overdraw their bank accounts (Lusardi, 2012; Reyna et al., 2009).

In Studies 2 and 3, outcomes were drinking (AUDIT $\alpha = .831$, $\alpha = .889$, respectively) and overall risk taking (ARQ $\alpha = .756$, $\alpha = .761$, respectively). The mean ARQ scores for Studies 2 and 3 respectively were 2.12 ($SD = .37$) and 2.10 ($SD = .37$), and the mean AUDIT scores for Studies 2 and 3 respectively were 4.54 ($SD = 5.03$) and 7.54 ($SD = 5.11$). Sensation seeking predicted greater problem drinking and risk taking: For the AUDIT, $\rho(843) = .381$ ($p < .01$) in Study 2 and $\rho(391) = .385$ ($p < .01$) in Study 3. For the ARQ, $\rho(843) = .532$ ($p < .01$) in Study 2 and $\rho(391) = .499$ ($p < .01$) in Study 3. Cognitive reflection was not significantly related to either drinking or risk taking.

DG-Gist predicted drinking and risk taking in both studies: For the AUDIT, $\rho(843) = -.217$ ($p < .01$) in Study 2 and $\rho(391) = -.301$ ($p < .01$) in Study 3. For the ARQ, $\rho(843) = -.189$ ($p < .01$) in Study 2 and $\rho(391) = -.189$ ($p < .01$) in Study 3. Thus, the DG-Gist Scale predicted outcomes outside the domain of money and finances, including the wide variety of risks assessed by the ARQ.

In Study 4, outcomes were drinking (AUDIT $\alpha = .790$) and overall risk taking (ARQ $\alpha = .760$). The mean ARQ score for Study 4 was 1.95 ($SD = .36$) and the mean AUDIT score was 4.49 ($SD = 4.94$). DG-Gist predicted the ARQ, $\rho(47) = -.292$ ($p < .05$) and the AUDIT, $\rho(47) = -.451$ ($p < .001$), whereas the Barratt Impulsiveness Scale did not, despite being a longer scale, ARQ: $\rho(47) = -.062$, $p = .677$; AUDIT: $\rho(47) = .009$, $p = .953$.

Regressions predicting problem behaviors

Table 4 presents results of regression analyses in Study 1 controlling for numeracy and pitting alternative predictors against one another: DG-Gist, Spendthrift-Tightwad, and delay discounting (MCQ). Each of the latter three is theorized to explain different aspects of forgoing present for future rewards. Outcomes for which there was sufficient variance were frequency of overdrawing bank accounts, frequency of saving, and amount of student loan debt (other outcomes had no significant predictors or the model failed).

The uncorrected k parameter derived from the MCQ displayed a skewness of 3.182 ($SE = .160$) and a kurtosis of 13.346 ($SE = .319$) in Study 1, and a skewness of 3.465 ($SE = .123$) and a kurtosis of 12.146 ($SE = .246$) in Study 3. These are above recommended thresholds

for acceptable deviation from normality, which are a skewness of 2 or a kurtosis of 7 (Micceri, 1989). This is the only variable in the study for which this was the case. Therefore, we conducted the same regressions using a log transformation of the k parameter in Studies 1 and 3. The pattern of results is similar whether the standard uncorrected parameter or log transformation is used; for example, beta weights for DG-Gist are virtually identical. Hence, we report the results using the standard k parameter in detail.²

For all three of the outcomes in Study 1, DG-Gist was a significant predictor: Greater delay of gratification was associated with less frequent overdrawn, greater saving, and less student loan debt. For one outcome, numeracy also accounted for unique variance; lower numeracy predicted less frequent overdrawn. For another outcome, Spendthrift-Tightwad predicted unique variance; being a tightwad (as opposed to spendthrift) was associated with more student loan debt—a relation similar to Propensity to Plan—suggesting that student loans might be different from other kinds of debt.

Analogous regressions were constructed to predict AUDIT and ARQ scores in Studies 2 and 3 (Table 5). In each of these studies, the predictive ability of DG-Gist was evaluated, while controlling for BSSS and CRT. In Study 3, we also pitted DG-Gist against delay discounting (MCQ) as a predictor. DG-Gist and BSSS were significant predictors in all four regressions. Thus, the gist measure of delay of gratification reliably explained variance in risky behaviors beyond sensation seeking. CRT and delay discounting were not significant predictors.

In Study 4, DG-Gist and Barratt Impulsiveness were entered as predictors of AUDIT and ARQ (Table 5). DG-Gist was a significant predictor of both AUDIT and ARQ, whereas the Barratt Scale was not a significant predictor of either outcome. In order to evaluate the Barratt Scale, a wider age range is desirable psychometrically because impulsivity is likely to vary from adolescence to adulthood, making it possible to observe covariation of impulsivity with outcome measures. Nevertheless, when we added age as a predictor, DG-Gist remained a significant predictor of AUDIT scores ($\beta_{\text{DG-Gist}} = -.384$, $t_{\text{DG-Gist}} = -2.416$, $p < .05$); Barratt impulsivity and age were not significant predictors. In other words, the DG-Gist results for AUDIT were robust controlling for age in Study 4.

Socioeconomic status was entered as an additional predictor in Studies 1 and 4. SES was a nonsignificant predictor of all outcomes, except for frequency of saving in Study 1 (Table S2). Not surprisingly, higher SES was associated with higher frequency of saving. When controlling for SES, DG-Gist remained a significant predictor of overdrawn bank accounts, frequency of saving, and amount of student loan debt (Study 1; Table S2) and of AUDIT scores (Study 4; Table S3); the p -value for the ARQ (Study 4) increased to .055 ($\beta_{\text{DG-Gist}} = -.319$, $t_{\text{DG-Gist}} = -1.971$).

²Regression analyses using the log transformed k parameter showed that it was a nonsignificant predictor for two of three outcomes in Study 1 and two of two outcomes in Study 3. However, for student loan debt, this predictor was significant such that greater discounting was associated with more debt ($\beta_k = .168$, $t_k = 2.390$, $p < .05$).

SUMMARY AND CONCLUSIONS

Our major goals were to extend research on gist principles in fuzzy-trace theory to the domain of delay of gratification; to develop a new instrument that incorporated the gist of social and cultural values related to sacrificing rewards in the present to achieve greater rewards in the future; to compare that instrument to related measures; and, finally, to test the ability of this new instrument to predict problem behaviors, beyond effects of other important factors, illuminating theoretical mechanisms that explain life outcomes.

The results of four studies showed that the new instrument (DG-Gist) captured a single dimension of delay of gratification, was consistently reliable, and demonstrated convergent validity with an array of prior measures. In our first study, we found significant correlations between DG-Gist and domain-general scales assessing future orientation, propensity to plan, and time perspectives as well as domain-specific scales related to financial outcomes assessing attitudes to debt, material values, and being a spendthrift as opposed to tightwad. In our second and third study, DG-Gist correlated with sensation seeking, cognitive reflection, and delay discounting (the latter did not replicate). In our fourth study, DG-Gist correlated with Barratt impulsivity. Each of these correlations was in a direction supporting our interpretation of the new instrument as measuring delay of gratification. However, none of these correlations was high, despite the scales' generally good reliability, indicating that DG-Gist did not duplicate existing measures or constructs.

The DG-Gist Scale draws on research showing that how people respond to time shapes life outcomes, whether this is measured as time preference, time perspective, future orientation, or the ability to wait for rewards, including a large literature on relationships between delay discounting and impulse control disorders (e.g., substance use problems; Bickel & Marsch, 2001; Figner et al., 2010; Webley & Nyhus, 2006; Zayas et al., 2014; Zimbardo & Boyd, 1999). Rather than assessing numerical trade-offs, this new scale is aimed at capturing the social, cultural, and psychological gestalt of willingness to sacrifice gratification in the present for the sake of greater rewards in the future. Each item on the scale is expressed as a simple gist principle, following the memory tenets of fuzzy-trace theory, rather than being highly elaborated and precise. Across four studies, DG-Gist significantly predicted a greater number of financial and health outcomes, compared with all prior measures that we tested. DG-Gist also accounted for unique variance in outcomes beyond individual differences in delay discounting, numeracy, the pain of paying (Spendthrift-Tightwad Scale), sensation seeking, impulsivity, and cognitive reflection and inhibition.

These results help illuminate understanding of real-world problem behaviors. With respect to the financial outcomes in Study 1, many people spend more than they would like to or have trouble saving money, and the roots in young adulthood of poor financial decisions—prior to manifestations such as bankruptcy—are poorly understood (Gärling, Kirchler, Lewis, & van Raaij, 2009; Hoelzl, Pollai, & Kamleitner, 2009). A variety of constructs have been used to explain poor financial decisions such as those we included in Study 1: general attitudes about risk and debt, time preferences, and material values (Lea et al., 1995; Richins, 2004; Zimbardo & Boyd, 1999). Another scale we included, the Spendthrift-Tightwad, addresses pain associated with spending money (Rick et al., 2008). For example,

people buy less impulsively when paying with cash instead of credit or debit cards, which is moderated by perceived pain of payment (Thomas, Desai, & Seenivasan, 2011). Relative to these existing measures, the gist of delaying gratification accounts for additional variance with a version of the “marshmallow task” that is suitable for young adults without investments, applies to men and women because specific choices are not specified, and extends over long time periods of delaying consumption of rewards.

Gist principles assessed by the DG-Gist Scale predicted not only financial decisions, but also global well-being, such as life satisfaction and overall happiness (Wilhelms, Helm, Setton, & Reyna, 2014). Global judgments of well-being are distinct from momentary, experiential happiness measured through real-time reports (Kahneman et al., 2006). For example, global judgments of well-being have a stronger correlation with income than experiential happiness does. Also, memories of happiness and other emotions often linger long after the verbatim details of experience fade (Rivers et al., 2008). Thus, global judgments of well-being are likely to reflect enduring gist principles, consistent with the relationships observed in Study 1.

In Studies 2 and 3, we also tested whether DG-Gist is related to sensation seeking and cognitive control in predictable ways (e.g., Reyna et al., 2011). As Duckworth et al. (2013), Eisenberg, Smith, Sadovsky, and Spinrad (2004), and others have argued, some individuals are pulled toward reward—they are more attracted to or sensitive to rewards (Carver & White, 1994; Hofmann, Friese, & Strack, 2009). These individuals are likely to find it more difficult to resist reward-related impulses. Thus, delay of gratification should be negatively related to reward sensitivity (e.g., as reflected in sensation seeking or behavioral approach; Hoyle et al., 2002) and positively related to cognitive control (e.g., as reflected in the Cognitive Reflection Test; Frederick, 2005), although these are all separable constructs (Liberali et al., 2012; Reyna et al., 2011). That is, sensitivity to rewards (approach) should impede the ability to delay gratification with those rewards (although larger rewards can motivate waiting if cognition remains cool rather than hot; Metcalfe & Mischel, 1999). Conversely, cognitive ability and control should enhance the ability to resist immediate rewards because these faculties support strategic thinking, such as cognitive distraction (Benjamin, Brown, & Shapiro, 2013; Kahneman & Frederick, 2007; Rodriguez, Mischel, & Shoda, 1989). Our results broadly support these expectations and bear on the construct validity of DG-Gist.

Turning to predictive validity, we examined whether DG-Gist predicted important health outcomes such as substance use (e.g., drinking using the World Health Organization’s Alcohol Use Disorders Identification Test (Babor et al., 2001), unprotected sex, and other risky behaviors. Many participants exhibited troubling levels of these risky behaviors; for example, the mean AUDIT score was 7.54 in Study 3, close to the clinical cutoff of 8 for alcohol dependence. We pit the DG-Gist Scale against other predictors of these problematic behaviors, such as delay discounting, impulsivity, and sensation seeking (Hoyle et al., 2002; Kirby, 2009; Romer & Hennessy, 2007). These results support theoretical models of individual differences in risk taking that separate reward-related approach (as in sensation seeking) from inhibitory faculties, including delay of gratification (e.g., Casey et al., 2011;

DeYoung, 2010; Noël, Brevers, & Bechara, 2013; Reyna, Wilhelms, McCormick, & Weldon, 2015; Stanovich & West, 2008).

However, DG-Gist was found to be a distinct construct that could not be reduced only to inhibitory faculties such as cognitive reflection or delay discounting (time preferences). Notably, DG-Gist predicted self-reported problem behaviors more consistently compared with standard measures of delay discounting and impulsivity. In sum, expressing delay of gratification in terms of simple gist principles—as opposed to eliciting judgments about precise numbers—provided new evidence for the role of such long-term mental representations of social values in resisting real-life risk taking as well as in deferring gratification in financial decisions (e.g., when people defer spending rather than go into debt).

There are a number of limitations of the present studies; as examples, additional work should examine the temporal and test–retest stability of DG-Gist, whether it predicts observed behaviors, and whether it is as effective a predictor for more diverse populations. Regarding diversity, Study 4 provides some initial evidence showing that DG-Gist is predictive for a community sample. However, there are likely to be social and cultural differences in endorsement of delaying gratification, as well as economic constraints on the ability to follow through on endorsed values (Anandi, Mullainathan, Shafir, & Zhao, 2013). In our view, subsequent work should not merely control for demographic differences statistically but, rather, should examine how delaying gratification *explains* such differences and how they relate to problem outcomes. The relations among DG-Gist, socioeconomic factors, and trait measures of self-control should also be assessed to build causal models of problem behaviors (Buckholtz, Reyna, & Slobogin, in press; Haws, Bearden, & Nenkov, 2012; Tangney, Baumeister, & Boone, 2004).

In addition, although most of our subjects have had the opportunity to engage in problem behaviors, they have yet to engage in a great deal of financial investment. The DG-Gist Scale was predictive of self-reported financial behavior (e.g., saving and debt) and choices to allocate money to savings, spending, or investing. However, this study needs to be replicated with mature investors to determine whether the scale predicts their financial behavior, such as the purchase of stocks, bonds, and other financial instruments. At the same time, it is worthwhile to have a scale that can be used with younger populations that potentially predicts financial difficulties later in life. Prevention programs could then be targeted to young people to improve lifetime savings and to avoid financial problems, such as debt, that snowball into major consequences, such as bankruptcy.

To conclude, a broader theoretical approach is needed to understand and ameliorate problem behaviors that brings together research on personality traits; cognitive and behavioral inhibition; social, cultural, and economic factors; and neurobiology. This delay-of-gratification measure provides an entering wedge to study neurobiological underpinnings of time preferences without the use of numerical tasks. The fact that the measure is simple, short, and theoretically motivated to capture the gist of pervasive social and cultural values suggests that it should have some utility in describing individual differences in a wide variety of populations.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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APPENDIX

SPEARMAN'S RHO (ρ) CORRELATIONS BETWEEN PREDICTOR VARIABLES AND PROBLEM OUTCOMES WITH MONEY IN STUDY 1

	Future Orientation	Attitudes to Debt	Propensity to Plan	Propensity to Plan (money now)	Propensity to Plan (money later)	Propensity to Plan (time now)	Propensity to Plan (time later)
How often do you pay ONLY the minimum payment on a bill?	.057	.125	-.093	.023	-.002	-.164	-.184
How often do you overdraw your bank account?	-.039	.110	-.072	-.056	.006	.007	-.049
How much of your bill do you pay every month?	-.137	.040	-.011	-.144	-.033	.125	.046
How often do you put away money into savings?	.158	.001	.146	.098	.199 **	.064	.055
Estimates of debt							
Credit card debt	.177 *	.249 **	.003	.020	.089	-.060	-.068
Student loan debt	.008	.124	.167 *	.100	.194 **	.068	.102
Automobile loan debt	-.127	.052	.111	.105	.094	.096	.037
Allocation task							
Spend immediately	-.027	.161 *	.018	.028	-.076	.109	-.001
Pay credit card bills	-.003	.154 *	.186 **	.118	.169 *	.094	.130
Pay other bills	-.013	.028	.113	.085	.073	.138 *	-.016
Put it in a checking account	-.127	-.075	-.089	-.078	-.128	-.017	-.076
Put it in a savings account	.064	-.077	.032	.062	.077	-.007	.045
Other	.040	-.046	.051	.020	.106	.032	.036
Subjective well-being							
Happiness	.028	.084	.078	-.005	.084	.158 *	.056
Life satisfaction	.046	.118	.075	-.014	.059	.137 *	-.007

Note:

*
p < .05

**
p < .01

DG-GIST ITEMS AND ORTHOGONAL ROTATED (VARIMAX) FACTOR LOADINGS
IN STUDIES 1, 2, AND 3

Item	Study 1: <i>n</i> = 211			Study 2: <i>n</i> = 845				Study 2: <i>n</i> = 393		
	Factor (% variance explained)			Factor (% variance explained)				Factor (% variance explained)		
	1 (31.6)	2 (13.9)	3 (9.5)	1 (33.9)	2 (11.0)	3 (9.4)	4 (8.8)	1 (34.0)	2 (13.1)	3 (9.0)
I believe in sacrifice now, enjoy later.	.660	-.204	.116	-.222	.046	.660	-.121	.655	.004	-.107
I wait to buy what I want until I have enough money.	.504	-.390	-.082	-.198	-.259	.639	-.247	.587	-.069	.476
I save up money to buy things I enjoy.	.394	-.494	-.008	.112	-.450	.710	.094	.502	-.161	.227
I think it is better to save money for the future.	.658	.056	.036	-.695	-.007	.326	.081	.673	-.110	.070
I never borrow money.	.049	.130	-.815	-.009	.010	.181	-.791	.087	-.136	.841
I think it is better to go without something I want until I can afford to pay for it.	.585	-.202	-.471	-.367	-.006	.546	-.405	.665	-.097	.445
I borrow money to buy things I enjoy.*	-.242	.294	.729	.181	.240	-.144	.722	-.160	.560	-.403
I am worried about the amount of money that I owe.*	.170	.187	.622	-.055	.479	.073	.522	.282	.524	-.386
I cannot seem to save money.*	-.122	.848	.074	.228	.798	-.170	.086	-.228	.800	-.026
I spend more than I can afford to spend.*	-.128	.777	.221	.256	.773	-.159	.191	-.109	.813	-.134
I think it is better to spend now and worry later.*	-.651	.178	.168	.816	.182	-.021	.180	-.576	.428	.009
I spend money on having fun	-.720	.173	.040	.656	.369	-.141	.083	.508	.529	.064

	Study 1: <i>n</i> = 211	Study 2: <i>n</i> = 845	Study 2: <i>n</i> = 393
	Factor (% variance explained)	Factor (% variance explained)	Factor (% variance explained)
today and don't worry about tomorrow. *			

Note: Asterisks represent a reverse-coded item. All items were answered on a 5-point scale ranging from *strongly disagree* to *strongly agree*. Loadings .400 and above are bolded.

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Figure 1.
Histogram of DG-Gist means across three studies

Table 1

DG-Gist items and oblique factor loadings in Studies 1, 2, and 3

Item	Study 1: <i>n</i> = 211 Factor (% variance explained)			Study 2: <i>n</i> = 845 Factor (% variance explained)			Study 3: <i>n</i> = 393 Factor (% variance explained)		
	1 (31.6)	2 (13.9)	3 (9.5)	1 (34.0)	2 (11.1)	3 (9.4)	1 (33.1)	2 (13.1)	3 (9.0)
I believe in sacrifice now, enjoy later.	-.554	.418	.100	-.481	.220	.370	-.404	.498	-.173
I wait to buy what I want until I have enough money.	-.621	.155	-.058	-.671	.058	.221	-.625	.277	.329
I save up money to buy things I enjoy.	-.572	.156	-.219	-.517	.067	-.038	-.529	.207	.077
I think it is better to save money for the future.	-.434	.366	.338	-.502	.555	.092	-.554	.398	-.064
I think it is better to go without something I want until I can afford to pay for it.	-.720	-.125	.266	-.649	.081	.423	-.684	.321	.280
I never borrow money.	-.270	-.668	.406	-.428	-.514	.430	-.465	-.205	.689
I borrow money to buy things I enjoy. *	.621	.527	-.118	.609	.432	-.173	.612	.339	-.108
I am worried about the amount of money that I owe. *	.219	.635	.021	.419	.552	.169	.281	.631	-.161
I cannot seem to save money. *	.600	.063	.613	.668	.085	.506	.664	.369	.340
I spend more than I can afford to spend. *	.620	.181	.502	.707	.157	.451	.632	.486	.234
I think it is better to spend now and worry later. *	.640	-.170	-.213	.615	-.306	.081	.657	-.135	.257
I spend money on having fun today and don't worry about tomorrow. *	.638	-.316	-.206	.636	-.290	.220	.652	-.031	.341

Notes: Asterisks represent a reverse-coded item. All items were answered on a 5-Point Scale ranging from *strongly disagree* to *strongly agree*. Loadings .400 and above are bolded. DG-Gist, delay of gratification-gist.

Table 2Descriptive statistics and Spearman's rho (ρ) correlations between DG-Gist and related scales

Scale	<i>M</i>	<i>SD</i>	Spearman's <i>rho</i> (ρ)	<i>n</i>
Study 1 correlations with DG-Gist ($\alpha = .778$)				
Future Orientation ($\alpha = .722$)	3.67	0.46	.215**	211
Attitudes to Debt ($\alpha = .712$)	2.56	0.34	-.388**	211
Propensity to Plan (mean) ($\alpha = .935$)	4.01	0.74	.274**	211
(short-run money) ($\alpha = .916$)	3.65	1.02	.211**	211
(long-run money) ($\alpha = .948$)	3.78	1.06	.340**	211
(short-run time) ($\alpha = .939$)	4.62	0.98	.102	211
(long-run time) ($\alpha = .944$)	3.96	1.01	.096	211
Spendthrift-Tightwad ($\alpha = .705$)	14.48	3.90	-.362**	211
Material Values (mean) ($\alpha = .853$)	2.97	0.54	-.173*	211
(success) ($\alpha = .833$)	2.99	0.76	-.105	211
(centrality) ($\alpha = .706$)	3.07	0.59	-.235**	211
(happiness) ($\alpha = .751$)	2.80	0.71	-.124	211
Time Perspectives Inventory				
(past-negative) ($\alpha = .839$)	3.00	0.67	-.145*	211
(present-hedonistic) ($\alpha = .822$)	3.32	0.49	-.077	211
(future) ($\alpha = .792$)	4.06	0.50	.194**	211
(past-positive) ($\alpha = .807$)	3.62	0.59	.100	211
(present-fatalistic) ($\alpha = .756$)	2.56	0.55	-.182**	211
Objective Numeracy ($\alpha = .601$)	9.49	1.61	.081	211
Monetary Choice Questionnaire (k)	0.020	0.030	-.085	211
Monetary Choice Questionnaire (log of k)	-2.13	0.73	-.085	211
Study 2 correlations with DG-Gist ($\alpha = .809$)				
Brief Sensation Seeking Scale ($\alpha = .796$)	3.23	0.74	-.248**	845
Cognitive Reflection Test ($\alpha = .637$)	1.42	1.12	.096**	845
Study 3 correlations with DG-Gist ($\alpha = .797$)				
Brief Sensation Seeking Scale ($\alpha = .809$)	3.18	0.75	-.177**	393
Cognitive Reflection Test ($\alpha = .598$)	1.53	1.11	.154**	393
Monetary Choice Questionnaire (k)	0.027	0.05	-.178**	393
Monetary Choice Questionnaire (log of k)	-2.11	0.47	-.178**	393
Study 4 correlations with DG-Gist ($\alpha = .771$)				
Barratt Impulsiveness Scale ($\alpha = .815$)	2.62	0.40	-.390**	47

Note: DG-Gist, delay of gratification-gist. All scales are averages across Likert responses ranging from 1 to 5 with higher responses indicating greater agreement, except the Spendthrift-Tightwad, which ranges from 4 to 26 with higher numbers indicating difficulty controlling spending; Objective Numeracy, which ranges from 0 to 11 indicating the number of correct responses; Monetary Choice Questionnaire, which is the k discounting parameter; and CRT, which ranges from 0 to 3 indicating the number of correct responses. Coefficients above .40 are bolded.

* $p < .05$

**
 $p < .01$

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Table 3

Descriptive statistics for outcomes and Spearman's rho (ρ) correlations between predictors and problem outcomes with money in Study 1

Outcome	M	SD	Predictor			
			DG-Gist	ST-TW	MCQ	ONS
How often do you pay ONLY the minimum payment on a credit card bill that you are for paying? responsible	1.78	1.50	-.242 *	.012	.157	-.196 *
How often do you overdraw your bank account?	1.53	1.12	-.209 **	.128	.123	-.141 *
Of credit card bills that you are responsible for paying, how much of your bill do you pay every month?	4.22	1.29	.253 *	-.002	-.136	.229 *
How often do you put away money into savings?	2.56	1.75	.245 **	-.139 **	-.046	-.065
Estimates of debt						
What is the current dollar value of your credit card debt, if any?	123.14	546.52	-.173 *	-.012	.042	.023
What is the current dollar value of your student loan debt, if any?	5328.7	11458.76	-.125	-.081	.130	.095
What is the current dollar value of your automobile loan debt, if any?	63.73	535.31	.010	.032	.056	-.079
If I gave you \$1000, what would you do with it? (allocation task)						
Spend immediately (on entertainment, a vacation, other fun activities)	12.90	17.63	-.198 **	.163 *	.170 *	-.103
Pay credit card bills	7.57	15.97	-.090	-.016	.042	-.071
Pay other bills	7.19	14.45	-.060	-.002	.098	-.137 *
Put it in a checking account	31.10	27.57	-.096	.073	.006	-.011
Put it in a savings account	32.67	28.88	.248 **	-.114	-.102	-.063
Other	8.55	11.53	-.019	-.130	.091	-.034
Subjective well-being						
All things considered, how satisfied are you with your life as a whole these days?	3.89	0.91	.181 **	-.102	-.050	.006
Taken all together, how would you say things are these days – would you say that you are very happy, pretty happy, or not very happy?	1.87	0.62	.128	-.144 *	-.067	-.010

^aNote: DG-Gist, Delay of Gratification-Gist; ST-TW, Spendthrift-tightwad; MCQ, Monetary Choice Questionnaire; ONS, Objective Numeracy Scale. Significant relationships are bolded. Response scales and scoring were as follows. Minimum Payment: never (1), less than once a year (2), between once a year and every six months (3), between once every six months and every month (4), every month (5); Overdraw: never (1), less than once a year (2), between once a year and every six months (3), between once every six months and once every other month (5), about once a month (6), several times per month (7); Credit Card: never (1), less than once a year (2), between once a year and every six months (3), between once every six months and every month (5); Saving: never (1), less than once a year (2), between once a year and every six months (3), between once every six months and once every two months (4), roughly every two months (5), every month (6); Life Satisfaction: very dissatisfied (1), dissatisfied (2), neutral (3), satisfied (4), very satisfied (5); Happiness: not too happy (1), pretty happy (2), very happy (3).

* $p < .05$ ** $p < .01$

Table 4

Regressions to predict problem outcomes with money in Study 1

	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>VIF</i>
DV: How often do you overdraw your bank account? ($R^2 = .075$)					
(Constant)	1.266	0.619		2.046*	
DG-Gist	-0.030	0.014	-0.156	-2.072*	1.244
Spendthrift-Tightwad	0.029	0.022	0.100	1.323	1.268
Objective Numeracy	-0.104	0.050	-0.141	-2.075*	1.020
Monetary Choice Questionnaire (k)	1.319	2.573	0.035	0.513	1.046
DV: How often do you put away money into savings? ($R^2 = .076$)					
(Constant)	5.208	.963		5.407**	
DG-Gist	0.074	0.022	0.247	3.304**	1.244
Spendthrift-Tightwad	-0.024	0.034	-0.052	-0.687	1.268
Objective Numeracy	-0.043	0.078	-0.037	-0.551	1.019
Monetary Choice Questionnaire (k)	3.024	4.026	0.052	0.751	1.044
DV: What is the current dollar value of your student loan debt, if any? ($R^2 = .068$)					
(Constant)	-9954.373	6043.056		-1.647	
DG-Gist	-451.716	140.469	-0.252	-3.216**	1.261
Spendthrift-Tightwad	-437.969	218.158	-0.159	-2.008*	1.286
Objective Numeracy	907.713	487.493	0.131	1.862	1.023
Monetary Choice Questionnaire (k)	21834.493	25913.128	0.060	0.843	1.055

Note: DV, dependent variable; DG-Gist: Delay of Gratification-Gist; k, delay discount rate; VIF, variance inflation factor, which assesses multicollinearity with values of 1 indicating no correlation, 1–5 moderate correlation, and 5–10 high correlation.

* $p < .05$

** $p < .01$

Table 5

Regressions to predict risky behaviors in Studies 2, 3, and 4

	<i>B</i>	<i>SE</i>	β	<i>T</i>	<i>VIF</i>
Study 2, DV: Adolescent Risk Questionnaire ($R^2 = .291$)					
(Constant)	1.162	0.061		19.043**	
DG-gist	-0.005	0.002	-0.079	-2.612*	1.085
Brief Sensation Seeking Scale	0.260	0.015	0.513	17.014**	1.076
Cognitive Reflection Test	0.000	0.010	-0.001	-0.031	1.009
Study 2, DV: Alcohol Use Disorders Identification Test ($R^2 = .134$)					
(Constant)	-5.000	0.911		-5.490**	
DG-gist	-0.110	0.026	-0.140	-4.195**	1.085
Brief Sensation Seeking Scale	2.072	0.228	0.303	9.092**	1.076
Cognitive Reflection Test	0.000	0.145	0.000	-0.001	1.009
Study 3, DV: Adolescent Risk Questionnaire ($R^2 = .285$)					
(Constant)	1.101	0.094		11.664**	
DG-gist	-0.007	0.003	-0.122	-2.766**	1.055
Brief Sensation Seeking Scale	0.244	0.022	0.495	11.319**	1.036
Cognitive Reflection Test	0.020	0.015	0.058	1.318	1.069
Monetary Choice Questionnaire (k)	0.273	0.320	0.038	0.853	1.064
Study 3, DV: Alcohol Use Disorders Identification Test ($R^2 = .214$)					
(Constant)	-12.410	2.412		-5.145**	
DG-gist	-0.389	0.067	-0.267	-5.766**	1.055
Brief Sensation Seeking Scale	3.988	0.551	0.332	7.238**	1.036
Cognitive Reflection Test	0.179	0.378	0.022	0.473	1.069
Monetary Choice Questionnaire (k)	7.386	8.180	0.042	0.903	1.064
Study 4, DV: Adolescent Risk Questionnaire ($R^2 = .101$)					
(Constant)	2.981	0.677		4.403**	
DG-Gist	-0.249	0.116	-0.333	-2.138*	1.189
Barratt Impulsiveness Scale	-0.044	0.143	-0.047	-0.304	1.189

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	<i>B</i>	<i>SE</i>	β	<i>T</i>	<i>VIF</i>
Study 4, DV: Alcohol Use Disorders Identification Test ($R^2 = .115$)					
(Constant)	19.917	9.025		2.207*	
DG-Gist	-3.599	1.550	-0.359	-2.322*	1.189
Barratt Impulsiveness Scale	-0.804	1.911	-0.065	-0.421	1.189

Note. DV, dependent variable; DG-Gist, Delay of Gratification-Gist; k, delay discount rate; VIF, variance inflation factor, which assesses multicollinearity with values of 1 indicating no correlation, 1–5 moderate correlation, and 5–10 high correlation.

*
 $p < .05$

**
 $p < .01$