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## The surprisingly low motivational power of future rewards: Comparing conventional money-based measures of discounting with motivation-based measures

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## ABSTRACT

Temporal discount rates are often poor predictors of behaviors that we expect will be motivated by the future. The current research suggests this may be because conventional discounting measures are poor measures of the motivational value of future rewards. In six studies, I develop motivation-based measures of the present value (PV) of future rewards and compare the PVs obtained with those obtained using conventional money-based discounting measures. Conventional money-based PVs consistently overestimate motivation-based PVs and are discriminable from them. I explore explanations for this mismatch, including timing of effort exertion (Study 2) and loss aversion (Study 3), both features of the motivation-based measures. In Study 5, I use self-reports of valuation strategies and a time pressure manipulation to demonstrate that participants use different valuation strategies in the conventional money-based and the motivation-based measures that, in part, determine the difference in PVs obtained and the relatively low correspondence between them.

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## Introduction

A wide range of people's behaviors in the present are motivated by future concerns: employees work for future bonuses, students study to obtain a degree, people exercise and follow healthy diets for future health, and they save for retirement. People are often myopic in these behaviors: procrastinating in their work, failing to exercise, eating unhealthy foods, and saving insufficiently.

The value that people place on the future relative to the present is the focus of research on temporal discounting, a topic that is studied extensively in psychology and economics and in some applied fields, such as health behavior and financial investment. Temporal discount rates are broadly applied, often used in the construction of public policies that concern the future in domains such as finance, health, the environment, and urban planning, where they can have a large impact on whether or not a policy or project is implemented. While there is debate in these domains on the appropriate rate to use, individuals' discount rates are con-

sidered one important source (see Baron (2000) and Gyrd-Hansen and Søgaard (1998), for a related discussion; Schelling, 2000).

Much research in temporal discounting involves measuring these discounting rates for individuals, to examine how rates vary for different individuals (e.g., Green, Fry, & Myerson, 1994; Kirby, Petry, & Bickel, 1999), in different decision domains (e.g., Chapman, 1996), for different magnitudes of rewards (e.g., Kirby, 1997), for different delays into the future (e.g., Thaler, 1981), and to examine the relationship between individuals' discount rates and relevant real-life behaviors (e.g., Bickel, Odum, & Madden, 1999; Chapman & Coups, 1999).

The motivation for much of this research, either explicitly stated or implied, is to predict individuals' present behavior based on individuals' discount rates for behaviors that researchers expect will be influenced by future concerns. These behaviors, such as saving for retirement, exercising, or eating healthily are typically multi-determined, motivated by future concerns ("I would love to be in shape for the beach this summer and I want to be healthy when I am older"), present concerns ("I am too tired to go to the gym today"), and factors intrinsic to the present behavior ("but once I get running on that treadmill I usually enjoy it"). Researchers are interested in all of these influences on present behavior. However,

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I suggest that research on temporal discount rates has been focused on understanding the first of these, the motivational power of future concerns for present behavior, but that it commonly uses measures that do a poor job of assessing motivational power.

Good measures of constructs should satisfy a number of criteria. In particular they should be valid, reliable, and sensitive (Cook & Campbell, 1979; Cronbach & Meehl, 1955). I suggest that the methods conventionally used to measure individuals' discount rates mean that the discount rates obtained are likely to be inaccurate, and therefore invalid, measures of the motivational power of the future in the present. Specifically, I suspect that conventional discount rate measures are likely: (1) to overestimate the motivational power of the future for individuals and (2) to be discriminable from measures of the motivational power of the future, showing relatively low correlations with those measures. These are the hypotheses examined in the present research.

#### *Conventional measures of discount rates and the motivational power of the future*

While people's present behaviors are multiply determined (by both future and present concerns), when researchers use temporal discount rates to predict behavior, the discount rates are arguably intended to capture the power of future concerns to motivate individuals rather than the power of more immediate concerns. This is suggested by the type of research conducted on discount rates, which invariably takes an individual difference approach, focused on comparing discount rates across individuals who vary on characteristics such as gender, age, personality (Green et al., 1994; Ostszewski, 1996), and chronic lifestyle behaviors such as smoking (Bickel et al., 1999; Kirby et al., 1999), and on comparing discount rates in individuals across stable decision contexts or domains (Chapman & Elstein, 1995). This approach to discounting – looking at enduring individual differences – makes sense given that people's long-term desires are unlikely to change rapidly from moment to moment, but rather are enduring concerns that guide an individual's general behavioral tendencies. In contrast, more immediate concerns are vulnerable to short-lived influences, including changes in visceral effects such as hunger (Read & Van Leeuwen, 1998) or temporary decreases in self-control (Baumeister & Vohs, 2003; Read & Van Leeuwen, 1998). Therefore, in this research I focus on the motivational power of future rather than present concerns.

In this research, I also focus on a particular kind of present behavior: behavior that involves exertion of effort. Effort is considered a key marker of motivated, as opposed to passive, behavior (Martin & Tesser, 2009), and effort is important in many present behaviors that are motivated by future concerns. This includes behaviors that depend on self-control, which itself requires effort (Baumeister & Vohs, 2003). These might include behaviors such as exercising, giving up smoking, and controlling spending, failure on which can have substantial negative consequences for individuals and societies and all which have been examined alongside discounting measures (e.g., Bickel et al., 1999; Fuchs, 1982). Therefore, in this research I focus on the power of future concerns to motivate individuals to exert effort in their present behavior.

Researchers tend to measure discount rates using just a couple of established methods (Frederick, Loewenstein, & O'Donoghue, 2002). Most commonly they use direct valuation on a monetary scale: asking people to state the present value of a future reward (such as “What value  $X$  would make the two options in the following statement equally attractive to you:  $\$X$  TODAY and  $\$120$  in 1 year?”) or to make a series of choices between reward options (such as “Would you prefer to receive  $\$100$  today or  $\$120$  in 1 year?”). Discount rates are then calculated based on the present values (PVs) obtained.

But how well do discount rates measured in this way capture the motivation that the future will have on individuals' behavior in the present? That is, are they accurate measures of the motivational power of the future for present behavior? Existing research cannot answer this question.

First, while existing research finds that conventionally-measured discount rates are often poor predictors of present behaviors that researchers expect will be motivated by future concerns or benefits (Frederick, Loewenstein, & O'Donoghue, 2002), the reasons underlying this are unclear. Behaviors examined in existing research include health promotion behaviors, such as exercising, getting flu vaccinations, and having dental exams (Chapman & Coups, 1999; Chapman et al., 2001; Fuchs, 1982), harmful addictive behaviors, such as smoking, drinking heavily and using heroin (Bickel et al., 1999; Kirby et al., 1999), and financial decisions, such as incurring credit card debt (Fuchs, 1982). Results are mixed with some correspondence between discount rates and behavior in some but not all studies (see Frederick, Loewenstein, and O'Donoghue (2002), for a review). For example, smokers, heavy drinkers and heroin addicts typically have higher discount rates than non-smokers and those who have quit smoking (Vuchinich & Simpson, 1998), light drinkers (Kirby et al., 1999), and non-addicts (Kirby et al., 1999), respectively. However, correlations between discount rates and behaviors such as exercise, dental exams or getting flu vaccinations (Bickel et al., 1999; Chapman & Coups, 1999; Chapman et al., 2001) are very low.

There could be a number of reasons for these mixed results. In particular, many of these behaviors are in a different domain from the conventional measures used (e.g., health versus money) and so concern different future benefits. Other discounting research has shown that individuals use different discount rates for different domains (Chapman, 1996) and for different future benefits (Sultan & Winer, 1993). Therefore, any lack of correspondence between the behavior and discount rate may often simply be due to differences in discounting across domains or type of benefit, and cannot answer the question of whether conventional discounting measures are accurate measures of the motivational power of the future in the present.

However, even studies that examine behaviors in the money domain, which would allow comparison with discount rates obtained by conventional discounting measures in the money domain, cannot adequately answer this question. Some studies appear, on first sight, especially promising in this respect, in that they infer individual discount rates directly from behavior, potentially providing a direct assessment of the motivational power of the future for present behavior for comparison with conventionally obtained discount rates. However, these studies have examined relatively complex behaviors that seem to be determined largely by factors other than the motivational power of the future.

For example, two studies of this type, Gately (1980) and Hausman (1979), infer individuals' discount rates based on the purchase of electrical durables, such as air conditioners and refrigerators. Such purchase decisions involve an implicit tradeoff between monetary benefits in the present and future as they involve a tradeoff of initial purchase price and electrical efficiency over time (greater initial purchase price corresponds to greater efficiency). However, in these studies, people's decisions appeared to reflect (or were largely determined by) considerations other than the motivational power of the future, such as current financial constraints (as in Hausman, 1979) or ignorance of future operating costs (as suggested by Gately, 1980). Therefore, existing research cannot tell us whether conventional measures of discounting provide accurate measures of the motivational power of the future for present behavior.

Furthermore, there is reason to believe that conventional discounting measures may in fact be inaccurate measures of the motivational power of the future for present behavior. People often use

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