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Does goal relevant episodic future thinking amplify the effect on delay discounting?

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ABSTRACT

Delay discounting (DD) is the preference for smaller immediate rewards over larger delayed rewards. Research shows episodic future thinking (EFT), or mentally simulating future experiences, reframes the choice between small immediate and larger delayed rewards, and can reduce DD. Only general EFT has been studied, whereby people reframe decisions in terms of non-goal related future events. Since future thinking is often goal-oriented and leads to greater activation of brain regions involved in prospection, goal-oriented EFT may be associated with greater reductions in DD than general goal-unrelated EFT. The present study ($n = 104$, $M_{age} = 22.25$, SD = 3.42; 50% Female) used a between-subjects 2×2 factorial design with type of episodic thinking (Goal, General) and temporal perspective (Episodic future versus recent thinking; EFT vs ERT) as between factors. Results showed a significant reduction in DD for EFT groups ($p < 0.001$, Cohen's d effect size = 0.89), and goal-EFT was more effective than general-EFT on reducing DD ($p = 0.03$, $d = 0.64$).

1. Introduction

Imagine choosing between a smaller immediately gratifying reward and a larger reward that you will not receive for many months or years. For example, either going out to a fancy but unhealthy meal now or saving for retirement in the future. In making these types of choices, we are biased toward immediate gratification and discount the future. Immediately gratifying rewards often compete with longer-term rewards or goals, which are of substantially greater value than the immediate reward. Thus, it is not surprising that the inability to delay gratification is a hallmark feature of many maladaptive behaviors such as gambling (Madden, Francisco, Brewer, & Stein, 2011), overeating (Epstein, Salvy, Carr, Dearing, & Bickel, 2010), and substance use (Bickel & Marsch, 2001). Despite the difference in value between the immediate and delayed rewards, individuals frequently discount the value of the delayed reward in favor of the immediate reward, a decisional process known as delay discounting (DD) (Bickel, Jarmolowicz, Mueller, Koffarnus, & Gatchalian, 2012).

One way to shift temporal perspective so that people are more likely to choose a larger, but delayed reward, is to engage in episodic future thinking (EFT) (Daniel, Said, Stanton, & Epstein, 2015; Daniel, Stanton, & Epstein, 2013a, 2013b; Lin & Epstein, 2014; Peters & Buchel, 2010). EFT is a skill that allows us to use mental simulation to place ourselves in the future and pre-experience an event (Atance & O'Neill, 2001). It increases personal connection towards the future, and activates brain regions involved in prospective thinking (Atance & O'Neill, 2001; Hershfield, 2011). EFT helps people accomplish func-

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tions such as future planning, decision-making, goal-attainment, and maintaining a personal sense of identity (Atance & O'Neill, 2001; D'Argembeau, Lardi, & Van der Linden, 2012). Engaging in EFT during decision making has been shown to reduce DD (Peters & Buchel, 2010) and is thought to improve the valuation (Benoit, Gilbert, & Burgess, 2011) or the cognitive search for the delayed reward (Kurth-Nelson, Bickel, & Redish, 2012).

Peters and Buchel (2010) were the first to demonstrate that EFT reduces DD. In a within-subjects design, brain activation using fMRI was measured during DD trials that contained either individualized EFT tags (experimental trials) or no tags (control trials). Episodic tags for each participant consisted of either positive or neutral future events that matched the time delays of the DD trials and these tags were matched on valence, arousal, and personal relevance (e.g. "birthday john"). Immediately following the DD task, participants rated the frequency of episodic associations of the tag, and how vivid the associations were during scanning. The vividness of episodic imagery and strength of involvement of the anterior cingulate cortex and hippocampus predicted the effects of EFT on reducing DD (Peters & Buchel, 2010).

Research has shown EFT effectively reduces DD in individuals that are typically high in DD (Daniel et al., 2013a), and that EFT reduces excessive energy intake in obese adults and children as well (Daniel et al., 2013b, 2015). In these experiments, personalized audio EFT cues that were played during an ad libitum eating task significantly reduced the amount of calories consumed by subjects compared to episodic thinking control conditions. The effect of EFT does not depend on the positive or neutral valence of the cues, but the effect is greater for those with better working memory (Lin & Epstein, 2014).

Benoit et al. (2011) investigated whether imagining spending money in hypothetical future events (e.g. £35 in 180 days at a pub) using EFT reduced DD in comparison to simply estimating what the money could be spent on in the situation. EFT specific to spending money in hypothetical scenarios was associated with a stronger reduction of DD than estimating what items the money could purchase. The effect of EFT on DD was greater for events that produced greater emotional intensity during decision-making. It is possible that imagining real events that someone is looking forward to would be even more powerful than hypothetical events because real events may have greater emotionality. Additionally, imagining future events related to financial goals may increase the ability to delay gratification toward the future than imagining hypothetical spending.

There are individual differences in the extent to which people consider the future consequences of their actions. Some people are more future-oriented while others are more present-focused. People who are more sensitive to immediate consequences may benefit the most from using EFT to decrease future discounting. Benoit et al. (2011) found that for participants who had higher immediate-biases, the effect of EFT specific to future spending had the greatest impact. In order to understand how to best implement EFT it will be important to continue to investigate whether the tendency to focus on the present or future affects the ability of EFT to reduce DD.

EFT cues in these studies have all been general future events, and not tied to personalized financial goals. However, research suggests that future thinking is often geared towards future goals (D'Argembeau et al., 2010; Smallwood et al., 2011). Furthermore, future thinking regarding personal goals leads to greater activation of brain regions involved in prospection (D'Argembeau et al., 2010). This suggests that, during a financial decision making task, imagining future events that are oriented to future financial goals may be more effective in reducing DD of future monetary rewards then more general future thoughts, such as thinking about an upcoming party. Improving the ability of EFT to reduce DD has important implications in the development of interventions for a variety of behaviors that are compromised by the inability to delay gratification. The present study was designed to investigate whether EFT specifically related to future financial goals and spending was more effective than general non-goal EFT in reducing monetary DD in comparison to episodic recent thinking (ERT) control groups.

2. Methods

2.1. Participants

Participants (n = 104) were recruited through an Introductory of Psychology subject pool, flyers posted around the University at Buffalo campus, and an existing database maintained by the Division of Behavioral Medicine. Forty-five percent of the participants were minority, fifty percent were female, and the average age was 22.25 (SD = 3.42). All participants graduated high school with eighty-eight percent having completed at least one year of college education. Interested subjects completed an eligibility survey on Survey Monkey prior to scheduling an appointment, to ensure they were 19–35 year old non-smokers with and had no learning disability or psychopathology that would limit adherence to the protocol (e.g. ADHD, depression, substance use other than marijuana or alcohol use). Participants were told they were participating in a study that sought to understand factors that influence financial decision-making, and were compensated with either course credit or mailed a check for $15. The Social and Behavioral Sciences Institutional Review Board of the State University of New York at Buffalo approved this protocol.

2.2. Experimental design and procedures

Each person was randomized to one of four conditions in a 2 x 2 factorial design, with EFT/ERT and General/Goal as the between group variables. ERT is a good control as it has the participant engage in a similar task that involves generation of recent, rather than future, cues. Eligible participants were scheduled for one 45-min visit to the laboratory. A pre-session