Short Report

The Hidden-Zero Effect

Representing a Single Choice as an Extended Sequence Reduces Impulsive Choice

Eran Magen,[1] Carol S. Dweck,[2] and James J. Gross[2]

[1]*University of Pennsylvania and* [2]*Stanford University*

Splurge on a vacation, or save for retirement? Sleep in late, or get up to exercise? The ability to resist a tempting, immediately available reward in order to obtain a larger delayed reward is the hallmark of self-control, and predicts important life outcomes, such as academic achievement (Duckworth & Seligman, 2005) and social adjustment (Mischel & Ayduk, 2004). Unfortunately, immediate rewards are often difficult to resist. One key factor that makes them so appealing is *temporal discounting*—the tendency to consider events as less important if they occur in the distant future, rather than in the near future (Ainslie, 2001). This tendency tempts people to choose a small immediate reward over a larger delayed reward, simply because the first is immediately available. But such a choice can greatly sabotage the attainment of long-term goals.

To study temporal discounting, researchers (e.g., Estle, Green, Myerson, & Holt, 2007) typically have participants choose between smaller, sooner rewards and larger, later rewards (e.g., "Would you prefer [A] $5 today OR [B] $6.20 in 26 days?"). Decision makers commonly view such situations as a choice between a *good* alternative soon and a *better* alternative later. However, these choices do not explicitly refer to the fact that choosing to receive one alternative also means choosing not to receive the other. In other words, decision makers are implicitly encouraged to choose between *one-shot* events, rather than between *sequences* of events, in which choosing an immediate reward also means choosing to receive nothing later, and vice versa (e.g., "Would you prefer [A] $5 today and $0 in 26 days OR [B] $0 today and $6.20 in 26 days?").

People's choices are heavily influenced by ways in which the alternatives are framed, even when the different frames are logically equivalent (Tversky & Kahneman, 1981). Given that people prefer sequences that improve over time (Ariely & Zauberman, 2003; Frederick, Loewenstein, & O'Donoghue, 2002), we hypothesized that representing each alternative as a sequence of outcomes, by explicitly referring to the hidden zero in each alternative, would increase participants' willingness to choose larger delayed rewards over smaller immediate rewards, as participants would prefer to choose sequences that appeared to improve over time.

METHOD

Our study was conducted on-line with two general-population samples, recruited through on-line advertisements. Participants in Sample 1 ($n = 112$; 14 males, 98 females; mean age $= 33.7$ years, $SD = 13.5$) made choices about hypothetical monetary rewards. Participants in Sample 2 ($n = 57$; 13 males, 44 females; mean age $= 32.1$ years, $SD = 11.0$) made choices about real monetary rewards and were informed in advance that one of their choices (selected randomly) would serve as the basis for their payment. Therefore, participants in this sample were motivated to base each choice on what they would actually like to receive, as any choice might be the one that would determine the magnitude and timing of their payment (McClure, Laibson, Loewenstein, & Cohen, 2004).

Each participant completed a questionnaire that consisted of 15 choice pairs. For each choice pair, participants indicated their preference between an immediate reward and a delayed, larger reward. Participants were randomly assigned to two conditions: Participants in the *hidden-zero* condition viewed traditional choice pairs (e.g., "[A] $5 right now OR [B] $6.20 in 26 days"), whereas participants in the *explicit-zero* condition viewed choice pairs in which the immediate option always ended with the phrase "and $0 in ___ days," and the delayed option always started with the phrase "$0 today and . . ." (e.g., "[A] $5.00 today and $0 in 26 days OR [B] $0 today and $6.20 in 26 days"). Immediate rewards ranged from $2 to $8, delayed rewards ranged from $5.40 to $8.70, and delays ranged from 7 to

Address correspondence to Eran Magen, Robert Wood Johnson Health and Society Scholars Program, University of Pennsylvania, 3641 Locust Walk, Philadelphia, PA 19104, e-mail: eranm@wharton.upenn.edu.
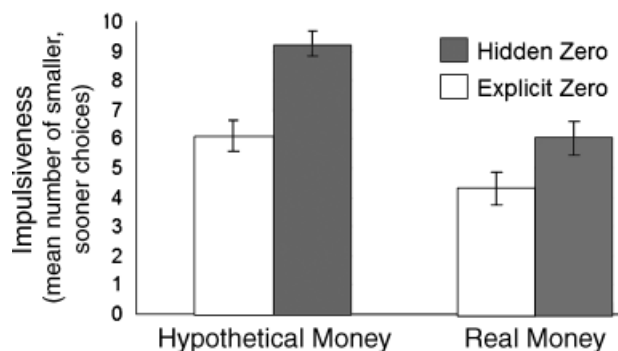
Fig. 1. Mean impulsiveness (number of times the smaller, sooner alternative was chosen out of 15 choice pairs) for each condition (explicit-zero vs. hidden zero) in each sample (hypothetical money vs. real money). Each error bar represents ± 1 *SE*.

140 days.[1] The magnitudes and delays of rewards in each choice pair were constant across conditions. Impulsiveness scores were computed by counting the number of times a participant indicated a preference for the sooner, smaller reward (range: 0–15).

RESULTS AND DISCUSSION

When choices concerned hypothetical money (Sample 1), participants in the explicit-zero condition exhibited significantly lower levels of impulsiveness ($M = 6.10$, $SD = 4.20$) than participants in the hidden-zero condition ($M = 9.24$, $SD = 3.20$), $t(110) = 4.43$, $p < .001$, $p_{rep} = .99$, $d = 0.84$. Similarly, when choices concerned real money (Sample 2), participants in the explicit-zero condition exhibited significantly lower levels of impulsiveness ($M = 4.42$, $SD = 2.90$) than participants in the hidden-zero condition ($M = 6.13$, $SD = 3.35$), $t(54) = 2.03$, $p = .05$, $p_{rep} = .92$, $d = 0.55$ (see Fig. 1).[2]

Despite the fact that the hidden-zero and explicit-zero formats of presentation were logically equivalent, the latter resulted in lower rates of impulsive choice, possibly because the explicit-zero format caused each choice to appear as a sequence, thereby encouraging people to select the improving sequence (i.e., the larger, later reward). The explicit-zero format may also draw attention to the *opportunity cost* of each choice, thereby encouraging people to choose the alternative that incurs a lower opportunity cost (i.e., to forgo the smaller, sooner reward). Additional research is required to elucidate the underlying mechanism of the effect observed in this study, and to test this effect in real-world settings (e.g., retirement savings).

The data presented here demonstrate how changing the construal of outcomes, even without changing their objective values, can have a powerful impact on individuals' ability to consider the future consequences of their decisions (Magen & Gross, 2007). The way alternatives are represented matters: By simply mentioning the "obvious" downsides of alternatives, one can help decision makers choose in a more informed and balanced manner, thereby helping them place more weight on the achievement of their long-term goals, rather than on immediate gratification.

REFERENCES

Ainslie, G. (2001). *Breakdown of will*. New York: Cambridge University Press.

Ariely, D., & Zauberman, G. (2003). Differential partitioning of extended experiences. *Organizational Behavior and Human Decision Processes*, *91*, 128–139.

Duckworth, A.L., & Seligman, M.E.P. (2005). Self-discipline outdoes IQ in predicting academic performance of adolescents. *Psychological Science*, *16*, 939–944.

Estle, S.J., Green, L., Myerson, J., & Holt, D.D. (2007). Discounting of monetary and directly consumable rewards. *Psychological Science*, *18*, 58–63.

Frederick, S., Loewenstein, G., & O'Donoghue, T. (2002). Time discounting and time preference: A critical review. *Journal of Economic Literature*, *40*, 351–401.

Magen, E., & Gross, J.J. (2007). Harnessing the need for immediate gratification: Cognitive reconstrual modulates the reward value of temptations. *Emotion*, *7*, 415–428.

McClure, S.M., Laibson, D.I., Loewenstein, G., & Cohen, J.D. (2004). Separate neural systems value immediate and delayed monetary rewards. *Science*, *306*, 503–507.

Mischel, W., & Ayduk, O. (2004). Willpower in a cognitive-affective processing system: The dynamics of delay of gratification. In R.F. Baumeister & K.D. Vohs (Eds.), *Handbook of self-regulation* (pp. 99–129). New York: Guilford Press.

Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, *211*, 453–458.

---

[1]The full questionnaire is available upon request.

[2]In the second sample, 1 outlier (more than 2 standard deviations from the group mean) was dropped from analysis. Including these data did not alter the pattern of results.