

Self-Rewards and Cash (Dis)Incentives:  
Consequences for Effort, Integrity, and Habit Formation

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Submitted in partial fulfillment of the  
requirements for the degree of  
Doctor of Philosophy  
under the Executive Committee  
of the Graduate School of Arts and Sciences

COLUMBIA UNIVERSITY

2019

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## **ABSTRACT**

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Incentives are fundamental and often powerful motivators of human behavior. Considerable research has focused on financial rewards as a tool to encourage “good” decisions. This dissertation examines the psychology and efficacy of monetary incentives—compared to multiple nonmonetary incentives—with respect to individuals’ choices, performance, and habits. I document and explore a variety of interrelated effects that cash, relative to noncash, incentives can incur in four major areas of behavior: habit formation, choice (specifically, tradeoffs involving risk and delay), goal setting, and integrity. In three longitudinal field experiments, I devise and empirically test a novel incentive program based on self-reward, where individuals defined and administered their own rewards for reaching a goal. I find that this system outperforms cash on several consequential metrics, including task engagement and longer-term persistence. I further place these behaviors in the context of a greater focus on compensation when incentivized with cash: People become fixated on attaining the reward over the process of expending effort. Although this mentality fuels efficient goal attainment, it can also lead to—as I show using a series of online studies—distortionary effects on other aspects of goal pursuit, such as the tendency to choose easier effort streams and the willingness to forgo a reward’s magnitude for its certainty or immediacy. Combined, these findings suggest that practitioners seeking to motivate their constituents may do well to reconsider the use of cash incentives.

# TABLE OF CONTENTS

<b>LIST OF TABLES</b> .....	v
<b>LIST OF FIGURES</b> .....	vi
<b>ACKNOWLEDGEMENTS</b> .....	ix
<b>DEDICATION</b> .....	xii
<b>CHAPTER 1 Introduction</b> .....	1
1.1 Motivation.....	1
1.2 The Present Research.....	2
<b>CHAPTER 2 Exercising Self-Control Through Self-Reward</b> .....	5
2.1 The Ubiquity and Limitations of Monetary Incentives .....	6
2.2 Intrinsic and Extrinsic Motivation.....	8
2.3 The Compensation-Reward Continuum and Self-Reward.....	10
2.3.1 Cash Incentives.....	12
2.3.2 Noncash Incentives .....	13
2.3.3 Self-Rewards.....	15
2.4 Consequences of Self-Reward on Behavior Change .....	16
2.5 Overview of Studies.....	18
2.6 Study 1: Incentives to Walk More .....	20
2.6.1 Design.....	20
2.6.2 Method.....	25
2.6.3 Results .....	31
2.6.4 Discussion .....	46
2.7 Study 2: Incentives to Walk More (Reprise) .....	47
2.7.1 Design.....	47
2.7.2 Method.....	48
2.7.3 Results .....	49
2.7.4 Discussion .....	55
2.8 Study 3: Incentives to Go to the Gym.....	56
2.8.1 Design.....	57
2.8.2 Method.....	58

2.8.3 Results .....	62
2.8.4 Discussion .....	70
2.9 General Discussion .....	71
2.9.1 Summary and Implications .....	71
2.9.2 Limitations and Extensions .....	73
2.9.3 Conclusion .....	75
<b>CHAPTER 3 Cash (Dis)Incentives .....</b>	<b>77</b>
3.1 Some Peculiarities of Cash Incentives .....	77
3.2 Compensation Focus: Consequences for Choice, Goal Setting, and Integrity .....	79
3.3 Overview of Studies .....	81
3.4 Study Series 1: Cash Incentives Increase Preference for Guaranteed Rewards .....	83
3.4.1 Study 1a: Exercise Programs .....	84
3.4.2 Study 1b: Language Learning Programs .....	85
3.4.3 Study 1c: Exercise Programs (Greater Expected Value for the Uncertain Reward) .....	86
3.5 Study Series 2: Cash Incentives Increase Preference for Immediate Rewards .....	88
3.5.1 Study 2a: Exercise Programs .....	88
3.5.2 Study 2b: Language Learning Programs .....	89
3.6 Study Series 1-2: Discussion .....	90
3.7 Study Series 3: Cash Incentives Increase Preference for Easier Goals .....	93
3.7.1 Study 3a: Choosing Easier Goals .....	93
3.7.2 Study 3b: Setting Easier Goals (Open-Ended) .....	94
3.7.3 Study 3c: Specifying Easier Goals (Closed-Ended) .....	96
3.7.4 Study 3d: Choosing Easier Tasks .....	98
3.8 Study Series 4: The Role of Effort Requirements on Reward Preference .....	104
3.8.1 Study 4a: The Effect of Effort Requirements on Preference for Guaranteed Rewards .....	106
3.8.2 Study 4b: The Effect of Effort Requirements on Preference for Immediate Rewards .....	108
3.9 Study Series 5: The Certainty and Immediacy “Premium” .....	110
3.9.1 Study 5a: Preference for Absolute Certainty .....	111
3.9.2 Study 5b: Preference for Absolute Immediacy .....	112
3.10 Study Series 6: Cash Incentives Increase Cheating on Real-Effort Tasks .....	115
3.10.1 Compensation Focus and Cheating Behavior .....	115
3.10.2 Study 6a: Counting Zeros .....	117
3.10.3 Study 6b: Solving Anagrams .....	122
3.10.4 Study 6c: Guessing Marbles .....	125
3.10.5 Study Series 6: Discussion .....	132
3.11 Study 7: People Prefer Cash Incentives and Think They Are More Motivating .....	132

3.12 General Discussion .....	135
3.12.1 Summary and Implications .....	135
3.12.2 Limitations and Extensions .....	136
3.12.3 Conclusion.....	138
<b>CHAPTER 4 Conclusion.....</b>	<b>140</b>
4.1 Review of Key Findings .....	140
4.2 Concluding Remarks.....	144
<b>REFERENCES.....</b>	<b>146</b>
<b>APPENDICES.....</b>	<b>154</b>
Appendix A1: Additional Perspectives on the Disincentivizing Effects of Monetary Incentives.....	154
Appendix A2: Pretest of Step Comparison Between Moves and Fitbit Device.....	156
Appendix A3: Pretest of Nonprofit Organizations.....	158
Appendix A4: Stimuli and Participant Instructions (Study 1) .....	158
Appendix A5: List of Nonprofit Organizations .....	169
Appendix A6: Individual Chronic Trait Measures.....	170
Appendix A7: Weekly Exercise Log.....	173
Appendix A8: Joint Evaluation of Incentive Programs in Exit Survey .....	174
Appendix A9: Sample Size and Attrition (Study 1).....	176
Appendix A10: Randomization Check for Participants Lost to Attrition (Study 1).....	177
Appendix A11: Sample Self-Rewards Defined (Study 1) .....	178
Appendix A12: Steps Walked During Week 2 and Week 3 of Incentive Period (Study 1) .....	179
Appendix A13: Distribution of Steps Walked, Weeks 1-2 (Study 1).....	180
Appendix A14: Supplementary Analyses of Individual Difference Measures (Study 1) .....	181
Appendix A15: Pretest of Lay Predictions Under Joint Evaluation (Study 1).....	183
Appendix A16: Sample Size and Attrition (Study 2).....	185
Appendix A17: Steps Walked During Week 2 and Week 3 of Incentive Period (Study 2) .....	186
Appendix A18: Clustering Around the Goal (Study 2).....	187
Appendix A19: Stimuli and Participant Instructions (Study 3) .....	187
Appendix A20: Sample Size and Attrition (Study 3).....	191
Appendix A21: Steps Walked During Week 2 and Week 3 of Incentive Period (Study 3) .....	192
Appendix A22: Replication Attempts for Pedometer-Based Intervention .....	193
Appendix B1: Hedonic Catalog (Study 1a).....	198

Appendix B2: Posttest of Perceived Feasibility of Step Goals (Study 3a).....	199
Appendix B3: Stimuli and Participant Instructions (Study 3d) .....	200
Appendix B4: Stimuli and Participant Instructions (Study 6a) .....	211
Appendix B5: Stimuli and Participant Instructions (Study 6b) .....	215
Appendix B6: Stimuli and Participant Instructions (Study 6c).....	218

## LIST OF TABLES

<i>Table 1:</i> Baseline summary statistics (Study 1).....	32
<i>Table 2:</i> Baseline summary statistics (Study 2).....	50
<i>Table 3:</i> Baseline summary statistics (Study 3).....	63



## LIST OF FIGURES

<i>Figure 1:</i> Flow of participants (Study 1).....	21
<i>Figure 2:</i> Screenshot of Moves app interface (Studies 1 and 2) .....	24
<i>Figure 3:</i> Percentage of participants who met the step goal (50,000+ steps) each week (Study 1).....	33
<i>Figure 4:</i> Average total steps walked each week (Study 1) .....	35
<i>Figure 5:</i> Distribution of steps in week 3 (Study 1).....	38
<i>Figure 6:</i> Distribution of steps in week 4 (Study 1).....	39
<i>Figure 7:</i> Density of steps walked in week 3 (Study 1) .....	40
<i>Figure 8:</i> Density of steps walked in week 3 (Study 1) .....	41
<i>Figure 9:</i> Average steps walked each day during the incentive period (weeks 1-3; Study 1).....	42
<i>Figure 10:</i> Average steps walked each day during the post-incentive period (weeks 4-8; Study 1).....	43
<i>Figure 11:</i> Choice shares of the three reward programs among participants assigned to each incentive condition (Study 1) .....	45
<i>Figure 12:</i> Percentage of participants who met the step goal (60,000+ steps) each week (Study 2).....	51
<i>Figure 13:</i> Average total steps walked each week (Study 2) .....	52
<i>Figure 14:</i> Screenshot of Runkeeper app interface with a sample logged activity (Study 3).....	61
<i>Figure 15:</i> Percentage of participants who met the goal (3+ visits) each week (Study 3).....	64
<i>Figure 16:</i> Percentage of participants who made at least 1 visit (Study 3) .....	66
<i>Figure 17:</i> Average total gym visits each week (Study 3).....	67
<i>Figure 18:</i> Average gym visits each day during the incentive period (weeks 1-3; Study 3).....	68
<i>Figure 19:</i> Average gym visits each day during the post-incentive period (weeks 4-6; Study 3) .....	69
<i>Figure 20:</i> Average time (minutes) spent per gym visit each week (Study 3) .....	70

<i>Figure 21:</i> Perceived attractiveness (indexed) of bonus reward offered in each incentive contract used in Study 1a.....	92
<i>Figure 22:</i> Distribution of self-imposed step goals (Study 3b) .....	95
<i>Figure 23:</i> Choice shares of selected step goals (Study 3c) .....	98
<i>Figure 24:</i> Sample preview of word search puzzle task (Study 3d) .....	100
<i>Figure 25:</i> Self-reported focus on the outcome of receiving the reward (7) as opposed to the process of engaging in the puzzle task (1) (Study 3d).....	103
<i>Figure 26:</i> Choice share of exercise incentive program offering the smaller-certain (over larger-uncertain) reward (Study 4a) .....	107
<i>Figure 27:</i> Choice share of exercise incentive program offering the smaller-immediate (over larger-delayed) reward (Study 4b) .....	109
<i>Figure 28:</i> Choice share of exercise incentive program offering the smaller but less uncertain (over larger but more uncertain) reward (Study 5a) .....	112
<i>Figure 29:</i> Choice share of exercise incentive program offering the smaller but less delayed (over larger but more delayed) reward (Study 5b).....	114
<i>Figure 30:</i> Sample table in Counting Zeros task (Study 6a) .....	118
<i>Figure 31:</i> Number of tables (out of 5) counted exactly correctly (Study 6a) .....	119
<i>Figure 32:</i> Percentage of participants who provided the exactly correct solution to each table (Study 6a).....	120
<i>Figure 33:</i> Number of tables (out of 5) counted exactly correctly when cheating was impossible compared to possible (Study 6a).....	122
<i>Figure 34:</i> Percentage of participants who reported solving the third (“impossible”) anagram (Study 6b) .....	125
<i>Figure 35:</i> A sample box of marbles in the Guessing Marbles task (Study 6c).....	126

*Figure 36*: Percentage of participants who overreported any points at all (Study 6c)..... 130

*Figure 37*: Average number of points overreported conditional on having overreported at all (Study  
6c)..... 131

## ACKNOWLEDGEMENTS

I am fortunate, throughout my time as a graduate student, to have been graced with the company and kindness of mentors, collaborators, colleagues, friends, and family, without whose support I would surely be lost. If I were to convey fully my gratitude to each and every one, this dissertation could easily be twice as long. So, at the risk of being completely incomplete, I will try to express my sentiments in brief.

I would like to thank my advisor, Ran Kivetz, to whom I credit a significant part of any individual growth I have achieved (both research-wise and personally) during my studies at Columbia. Our collaborations over the years have taken many different forms, but his brilliance and creativity have been a constant source of inspiration. The consistently high expectations he has set continues to push me to strive for excellence in all things—as a researcher, but also in other arenas of life. (It has often been said that a 30-minute discussion with him amounts to hours of wisdom gained; my own interactions are certainly testament to this claim.) Most of all, I am grateful for the steadfast support and patience he has shown me.

This research has benefited at various stages, directly or indirectly, from discussions with many individuals whom I feel honored to call my collaborators and colleagues. I am indebted to the members of my proposal and dissertation committee—Ran Kivetz, Oded Netzer, Gita Johar, Silvia Bellezza, and Jim Corter—for their time and invaluable feedback, as well as to all the marketing faculty at Columbia Business School for the repository of knowledge and training bestowed on me. My deepest thanks in particular go to: Jacob Goldenberg, who in the many years we have known each other has always believed in me, whose encouragement has helped me on several occasions to not lose sight of the bigger picture, and whose surpassing kindness and generosity mean more than I can say; Gita Johar, whom I am immensely humbled and privileged to have as a collaborator and

mentor, and for her unfailing warmth and graciousness cannot thank enough; Eva Ascarza, who has lifted my spirits more times than I can count and whose singular wit, humor, and enthusiasm for research and life are nothing short of contagious; and Oded Netzer, who has always looked out for me, and whose exceptional intelligence and compassion I admire and can only attempt to emulate.

I am also greatly appreciative of the numerous conversations I have had with, and counsel I have received from, several colleagues and friends (each of whom has left an impression on me in their own way): Nick Reinholtz, Leonard Lee, Don Lehmann, Dan Bartels, Miklos Sarvary, Liz Webb, and Ye Li. Earnest thanks go also to Chung Ho, Vee Onativia, Amanda Eckler, Dan Spacher, and Elizabeth Elam, whose tireless efforts and patience are truly inspiring. And, to all the research assistants I got to mentor—and to Jon Hurwitz, Jin Miao, and Ruouo Li in particular—thank you for your diligence and dedication, without which parts of this document would likely not exist.

Accompanying me along this adventure has been a delightful assortment of peers, each lovely, kind, and uniquely talented, whom I feel incredibly lucky to have as friends. The experiences we have shared have made my good days as a graduate student more enjoyable and my not-so-good days less trying. I am especially grateful to Daniel He, Jaeyeon Chung, Alain Lemaire, Evan Weingarten, and Youjung Jun for the tremendous support they have given me, and for the countless hours of conversations we have exchanged on research and life. Many thanks are also in order to Yael Karlinsky, Hannah Chang, Maayan Malter, Ke Zeng, Ashley Culver, Andrew Long, Freeman Wu, and Shruti Koley.

Finally, I would like to extend a few personal remarks to my family. To my parents, Hongxing Meng and Xiaoxi Guo: Baba, Mama, you have done more for me throughout my life than I could ever describe. Your unceasing love and sacrifice are unmatched, and you have given me support, provisions, and guidance in all things unconditionally. I cannot thank you enough for always being there for me and giving me a home. I am also blessed to have a supportive network in

my extended family and relatives, who are scattered around the globe—to my grandparents, and to my grandmother (Nai Nai, you are sorely missed); to my parents- and sister-in-law; as well as to my uncles and aunts, nieces and nephews, and cousins young and old, I send my warmest affection.

I'd like to close with a special thanks to the motley crew who are my closest, dearest buds. To Rahul, Erica, and Tote: Your companionship and encouragement have kept me sane in so many ways over these years. Thank you for all the laughs, conversations, fond memories, and plushies (among other miscellany) you've supplied me, and for tolerating my invariable bouts of silliness and neuroticism. Adam: When I am reminded of you, I often feel a surge of happiness and pride to have you as my friend (a shoutout to freerice.com for bringing us together that one day over 11 years ago!): your work ethic and passion for research, which I fiercely admire; the way our wavelengths tend to sync; all the wordplays and observations about the world (too many to recount); and a bond neither time nor distance can break. Jr ("JrIceman"): We may have met not too long ago, but to me we might as well have known each other for ages. I'm deeply grateful for your love and friendship, and the "prespostrous" ways in which we'll often banter. I count myself exceedingly privileged knowing you'll always have my back (and tell me to straighten it, no doubt). For now and always, online or offline, thank you for being the *Friendo* to my Ghüs. And, finally, Brian: You have been with me through all my successes and failures, and have looked after me in ways I far too often take for granted. No sentiments I can express can quantify your immeasurable love or how lucky I am to have you in my life.

## DEDICATION

*For BJD (fubbalò).*

# CHAPTER 1

## INTRODUCTION

### 1.1 Motivation

Incentives motivate us. Whether externally imposed or internally generated, they often serve as strong reinforcers of human behavior. A central concern for researchers and practitioners interested in promoting individuals' wellbeing in the marketplace is the design of incentive systems that galvanize enduring healthy habits. Over the past several decades, a vast literature has sought to better understand the role of incentives in motivation and self-control, attracting a swath of perspectives—from economics and marketing to organizational behavior, psychology, philosophy, political science, and behavior therapy.

The customary approach in economic theory, a “gold standard” widely practiced by scholars and organizations, has been to use monetary incentives as a means of inducing desired outcomes (*e.g.*, exercising more, eating healthier, achieving better grades, and so forth). This is hardly surprising, since monetary rewards (especially cash) command significant lay appeal thanks to the flexibility and liquidity they confer. On the other hand, they are not without their disadvantages. For example, many financial-based efforts have found little success in generating sustained effects, causing gains accumulated in the short run to evaporate once incentives are withdrawn (*e.g.*, John et al. 2011). Further, from a psychological standpoint, cash rewards can sometimes undermine positive change by “crowding out” intrinsic motivation (*i.e.*, an individual's desire to perform a task for its own sake; for reviews, see Bénabou and Tirole 2003 and Deci, Koester, and Ryan 1999).



Despite the wealth of information on the effects of financial compensation, our understanding of the efficacy of nonmonetary relative to monetary (cash-based)<sup>1</sup> incentives in shaping behavior remains fairly impoverished. In the present investigation, I attempt to shed some more light on this matter.

## 1.2 The Present Research

My dissertation examines the consequences of cash incentives—compared to multiple noncash reward structures—on shaping behavior along various stages of goal pursuit. I dissect this question in the next two chapters, which are motivated by two broad, related problems: First, I ask how well noncash incentive programs (and specifically a novel one predicated on self-rewards) might fare, relative to cash-based programs, in improving performance and habit formation. Second, I explore the peculiarities of cash incentives in particular and document the myriad ways in which cash can act as a disincentive. Unifying these two strands of research, I claim, is a connective tissue characterized by a heightened preoccupation with securing a reward (as opposed to fully engaging in the effortful activity at hand)—what I call *compensation focus*. Such a mindset<sup>2</sup> is, perhaps, well illustrated by the expression “getting the most bang for the buck,” an idea that encompasses maximizing expected outcomes while concurrently minimizing effort expenditure.

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<sup>1</sup> I use the terms “cash” and “monetary incentives” interchangeably throughout this dissertation. Certainly more granular distinctions can be made between the two (*e.g.*, cash can often operate differently from credit cards, discounts and promotions, and the like), but I leave this as an important empirical question to be answered in future work.

<sup>2</sup> I use “mindset” here in the colloquial sense of the term—referring to a general mentality, attitude, and mode of reasoning. There exists a large and growing literature on mindsets in consumer behavior and psychology (*e.g.*, Keinan and Kivetz 2011; Wyer and Xu 2010), including their associative triggers and spillovers to (often unrelated) tasks; whether the compensation focus I refer to throughout this dissertation indeed constitutes a *mindset* as the literature understands it is less clear.

Chapter 2 investigates people’s habit formation “in the wild,” under noisier but more naturalistic settings. The questions I tackle are straightforward: How can we encourage people to engage in a healthy behavior more often, like walking or going to the gym? Given a desired performance goal (*e.g.*, walking 10,000 steps a day), will people work harder when they enter a reward program that offers cash incentives, noncash hedonic incentives (of equivalent retail value), or self-defined and self-administered rewards? Further, which of these incentive contracts will generate more longevity of effort after the intervention is over (*i.e.*, upon the cessation of extrinsic incentives)?

The results of three longitudinal field experiments, which looked at physical fitness (walking and going to the gym), suggest the viability of self-rewards as an effective incentive system. By *self-rewards*, I refer to indulgent rewards defined and administered by the individual himself at his own cost<sup>3</sup> in return for meeting a predefined effort criterion, in contrast to rewards imposed by an external agent (*e.g.*, a firm paying its employees to visit the gym). Specifically, participants who rewarded themselves for reaching a weekly goal performed equally well as those who could earn cash during the incentive period and, more notably, demonstrated greater sustained effort thereafter for several weeks. Financially-incentivized participants, by contrast, although more likely to meet the prescribed goals during the incentive period, tended to revert to baseline (control) activity levels immediately thereafter. These findings offer some cautionary insight into the use of cash rewards to alter habits, with clear implications for the design of incentive contracts that aim to stimulate meaningful behavior change.

In Chapter 3, I place the aforementioned behaviors within a broader framework centered around the greater compensation focus that monetary incentives engender. Turning here to more

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<sup>3</sup> That is, the cost of the reward (whether in terms of money or time) is borne fully by the individual rather than the program sponsor.

controlled tests under single-shot decision settings, I attempt to understand how cash, relative to noncash rewards with equal monetary value, can affect a number of interrelated behaviors corresponding to various stages of goal pursuit. Specifically, I propose that by shifting people's priorities toward the outcome of reward attainment (over the process of engaging in a focal task), cash incentives lead them to favor "safer" alternatives that guarantee payoff. This has implications for what kinds of reward contracts people choose (when risk or delay is involved), the types of goals they set, and how much integrity they exercise when completing a task.

Empirical evidence from seven series of studies found that compared with noncash (hedonic) rewards, individuals who could earn cash incentives were more likely to: (i) select smaller-certain and smaller-immediate rewards over larger-uncertain and larger-delayed rewards (respectively); (ii) settle for easier (*i.e.*, "low-risk, low-reward") performance goals and tasks; and (iii) cheat more to secure compensation.

These patterns, taken together with the insights from Chapter 2, contribute to our understanding of the part that different kinds of incentives play in shaping habit formation, effort streams, and integrity. The outcomes I study in this dissertation (using participants sampled from the lab, online, and in the field) capture a diverse but interconnected array of behaviors—ones that span hypothetical as well as consequential choice, short-term as well as long-term performance, and decision spaces that often feature real effort with real incentives. Recognizing these areas of behavior as manifestations of a possibly excessive focus on compensation may help clarify why individuals can respond to the provision of cash incentives in counterproductive ways.

## CHAPTER 2

### EXERCISING SELF-CONTROL THROUGH SELF-REWARD

A fundamental goal of many (including scholars, firms, and policymakers) is to change people's behaviors—whether they be those of the consumer, the employee, or their own. Overcoming inertia presents a significant challenge; humans are naturally creatures of habit, particularly when it pertains to matters of self-control. Because individuals generally respond to incentives,<sup>4</sup> a commonly employed method to incite motivation is to directly reward good decisions or punish bad ones. Interventions in this tradition have predominantly relied on financial (*i.e.*, monetary or cash) rewards to encourage good behavior, as when researchers pay people to go to the gym or to quit smoking (*e.g.*, Charness and Gneezy 2009; Donatelle et al. 2004).

Extensive study on the motivational reach of monetary incentives points to a largely mixed effect on positive behavior change (see, *e.g.*, Gneezy, Meier, and Rey-Biel 2011), with many interventions based on financial compensation finding transient success at best (and some finding a net negative impact). Despite this, experimental tests that directly compare monetary with nonmonetary reward structures in the context of improving individuals' effort and performance remain scarce. A relevant empirical question, then, concerns what *kinds* of incentive schemes are effective in promoting healthy habits like walking more or going to the gym regularly—both during and after the intervention. I attempt to dissect this problem in the subsequent sections.

The rest of this chapter is organized as follows: First, I review relevant literature on performance-contingent incentives (particularly monetary ones) as they relate to intrinsic and extrinsic motivation. I next develop a conceptual framework that attempts to map cash incentives,

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<sup>4</sup> An oft-cited tenet in economics.

tangible noncash rewards, and what I call *self-rewards* along a “compensation-reward” continuum, in which incentives categorized along the compensation end are likely to evoke extrinsic motivation, while those categorized along the reward end are more conducive to intrinsic motivation. Then, I formulate testable hypotheses based on this continuum and present three longitudinal field experiments, each featuring a reward program that directly pit self-rewards against cash incentives in improving people’s physical activity.<sup>5</sup> The empirical evidence suggests that allowing individuals to define and impose their own rewards generated better performance with respect to both engagement in the focal task (either walking or going to the gym) as well as persistence and habit formation in the weeks following the intervention. I conclude by discussing the implications, both psychological and managerial, of such an approach on motivation and the design of incentive contracts.

## **2.1 The Ubiquity and Limitations of Monetary Incentives**

When engineering tools to change human decisions and behavior, a customary (and usually default) approach, reflected in both economic theory and industry practice, has appealed to cash or monetary incentives as impetus. A wealth of interventions relies on financial remuneration to encourage good habits or curb bad ones (for a review, see Gneezy et al. 2011), whether it be paying people to go to the gym (Charness and Gneezy 2009), to improve academic performance (Levitt, List, and Sadoff 2016), to buy healthier food (Schwartz et al. 2014), to boost worker productivity (Lazear 2000; Prendergast 1999), or to quit smoking (*e.g.*, Donatelle et al. 2004).

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<sup>5</sup> In the first of these experiments, I also examined the effects of tangible noncash rewards in the form of hedonic prizes.

Despite the many benefits conferred by monetary incentives (among them universality, fungibility, and flexibility), multiple streams of research suggest that they also carry notable disadvantages. As I prefaced earlier, work in economics and other disciplines has uncovered somewhat mixed results on the efficacy of cash incentives in motivating both short-run improvement and long-term performance (*e.g.*, Gneezy et al. 2011). I review a handful of cases below.

First, many financial-based interventions spanning a host of domains have struggled to generate sustained progress, with people often reverting to their old ways once incentives are withdrawn (*e.g.*, Charness and Gneezy 2009; Giné, Karlan, and Zinman 2010; John et al. 2011; Volpp et al. 2008).<sup>6</sup> For example, participants who faced monetary compensation for losing weight responded positively during an 8-month incentive period but subsequently regressed during the post-intervention period, resulting in substantial weight regain after 32 weeks (John et al. 2011). These findings are echoed in a number of studies in this area, which have documented an overarching failure (or at best modest success) by price-based incentive programs—including ones incorporating behavioral economics principles such as loss aversion—to help individuals maintain their weight loss (*e.g.*, Jeffery et al. 2000; Jeffery, Thompson, and Wing 1978).<sup>7</sup> Conceptualizing the interaction between rewards and individual motivation using a principal-agent framework, Bénabou and Tirole (2003) conclude that performance incentives serve as “weak reinforcers in the short run and negative reinforcers in the long run.”

Second, even when price-based incentives are potent when present, they can sometimes distort behaviors or undermine meaningful change by “crowding out” intrinsic motivation (for

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<sup>6</sup>Although some debate persists on the extent and magnitude of these post-reward effects (Goswami and Urminsky 2017; see also Kivetz, Urminsky, and Zheng 2006).

<sup>7</sup>In the context of consumption, too, there have surfaced similarly mixed results on the longer-run efficacy of deals, discounts, and price promotions and whether they may ultimately decrease brand loyalty upon retraction (*e.g.*, DelVecchio, Henard, and Freling 2006; Dodson, Tybout, and Sternthal 1978).

reviews, see Bénabou and Tirole 2003 and Deci, Koester, and Ryan 1999; see also Deci 1972; Lepper, Greene, and Nisbett 1973). That is, individuals may attribute their interest in the focal activity to an external factor (*i.e.*, a cash bonus) rather than deriving inherent pleasure or fulfillment from engaging in the activity itself. I review this phenomenon further in Section 2.2.

Other documented anomalies in the success of incentive systems include counterproductive effects on performance when an agent offers financial rewards for prosocial behavior, when s/he provides too many options, and when s/he pays too much or too little (for a review, see Kamenica 2012). Drawing from research on the relative difficulty of justifying the consumption of hedonic relative to necessity goods (*e.g.*, Kivetz and Simonson 2002; Okada 2005), Jeffrey (2009) documented in one laboratory study that cash incentives led to less productivity among university staff on a word game task compared to tangible noncash prizes such as a luxury massage. Finally, in the context of compensating participants in experimental economics and psychology, Read (2005) cautioned against requiring the use of real (monetary) incentives, as they do not always guarantee the researcher's desired effects above those obtained in hypothetical studies.

## **2.2 Intrinsic and Extrinsic Motivation**

As Section 2.1 relayed, monetary incentives do not always work when it comes to changing people's behaviors. Why, then, do they sometimes backfire or fail to achieve their desired end? A major stream of research on intrinsic versus extrinsic motivation suggests that extrinsic incentives can sometimes undermine, or "crowd out," intrinsic motivation<sup>8</sup> (*e.g.*, Bénabou and Tirole 2003; Deci

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<sup>8</sup> The question of why monetary incentives can disincentivize behavior has been the subject of considerable scrutiny in the economics literature (for review, see Gneezy, Meier, and Rey-Biel 2011) and lies outside the scope of this dissertation. In Appendix A1, I briefly discuss a few alternative perspectives to the "overjustification" account that may govern when cash or financial incentives can lead to ostensibly perverse effects.

1971; Deci et al. 1999; Frey and Oberholzer-Gee 1997; Higgins et al. 1995; Kivetz 2005; Kruglanski, Friedman, and Zeevi 1971; Lepper et al. 1973). To the extent that a person derives no reward except for the activity itself, s/he is said to be intrinsically motivated in performing that activity. By contrast, if the same individual is (or perceives him/herself to be) driven to engage in an activity for some reason or motive outside the task, s/he is said to be extrinsically motivated.

The seminal crowding out (or “overjustification”) effect reported in the literature occurs when individuals attribute their interest in the focal activity to an external source (*e.g.*, “cold, hard cash” or the threat of punishment) rather than to inherent pleasure or meaning from pursuing the activity. In a classic experiment, Deci (1971) observed that undergraduates in the laboratory spent less free time working on interesting puzzles when they had been temporarily paid \$1 per puzzle in a previous session than when they solved them for free. By the same token, paying people to donate blood may counteractively reduce the supply of blood donors by crowding out existing motivations of altruism and civic duty (Titmuss 1970; *cf.* Mellström and Johannesson 2008). Because individuals often prefer to construe their behavior as intrinsically motivated, incentives have also been shown to arouse reactance if the reward is not congruent with (*i.e.*, is unrelated to) the promoted consumption effort (Kivetz 2005).

Notably, the work on overjustification by Lepper and colleagues (1973) suggests that incentives can undermine or crowd out intrinsic motivation only when they are *superfluous*—meaning if the individual would have engaged in a focal behavior in the first place or possessed an internal motivation to do so. External incentives, importantly, can still be tremendously useful tools in motivating actions that a decision maker struggles to perform or improve upon. This, I believe, is particularly true in the context of self-control dilemmas, where people too often fall short of their desired longer-term goals.



In the current research, I draw from and build on the well-established literature above, and in particular on the fundamental tension between intrinsic and extrinsic motivation, to derive a framework that seeks to categorize different types of incentives (monetary and nonmonetary) along a continuum corresponding to their mental representation—that is, as *compensation* on the one extreme or as *reward* on the other. I directly assess the relative influence of cash and noncash incentives on several performance metrics associated with goal pursuit (*e.g.*, goal attainment, task engagement, and longer-term persistence and habit formation). Of particular interest—and, indeed, the crux of this chapter—is the efficacy of a novel incentive mechanism I designed based on *self-reward*, in which people gave themselves something that they defined in advance as a reward for meeting a prescribed goal. I elaborate on these ideas in the sections that follow.

### **2.3 The Compensation-Reward Continuum and Self-Reward**

A core argument I advance, and test, is that different types of incentives can change how people encode, almost instinctively, the value attached to effort expenditure when pursuing a goal and, in turn, differentially affect various aspects of their performance (*e.g.*, whether they attain the goal vs. how much they engage or persist in the activity). Consider an individual who struggles in maintaining regular physical fitness and would therefore benefit from enrollment in some sort of exercise incentive program. Taking the set of all externally-mediated rewards this person could face (*i.e.*, rewards which lie outside the focal behavior as opposed to rewards s/he may derive from the behavior itself<sup>9</sup>), I suggest that a useful exercise is to further classify these incentives along a

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<sup>9</sup> Such internally-mediated rewards might come in the form of inherent enjoyment from exercising, or the pleasure of investing effort for effort's sake.

continuum, from ones that signify “compensation” on the one extreme to ones that signify “rewards” on the other extreme.

Specifically, by compensation I refer to the quality (or perception) of being entitled to a reward conditional on investing effort or meeting a goal. In other words, a person who interprets an incentive as compensation will tend to view it as due payment for their work; the focus becomes less on the activity or effort stream itself but rather being rewarded for that activity (“doing A to get B”). Consistent with the overjustification effects discussed previously (Section 2.2), imposing incentives that make people feel as if they are being compensated to perform at a certain standard will likely cause them to attribute their actions to the reward as opposed to the task at hand—and to behave accordingly.

On the other end, I posit that some extrinsic incentives can evoke perceptions and responses in terms that are less about compensation and more about reward. That is, a person who interprets an incentive as simply a reward will tend to view it as a by-product of engaging in an effortful activity—here the focus rests not so much on a “tit-for-tat” understanding of effort and reward, but rather on performing the focal task and subsequently being rewarded (“doing A, and then getting B”). Under this lens, I reason, intrinsic motivation is less likely to be undermined compared to a compensation-oriented perspective.<sup>10</sup>

The notion of a “compensation-reward” continuum is in line with some work that distinguishes between “outcome” versus “process” motivation, according to which people can pursue an activity either as a means to an end or for its own sake (*e.g.*, Touré-Tillery and Fishbach 2011; Shen, Fishbach, and Hsee 2015).<sup>11</sup> Previous research on goal setting and self-regulation has

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<sup>10</sup> I revisit and expand this idea of a “compensation focus” in Chapter 3.

<sup>11</sup> This literature, however, has tended to compare the effects of monetary incentives against unrewarded controls; direct comparisons of the relative effects of cash compared to noncash (*e.g.*, hedonic yet similarly extrinsic) rewards in altering behavior remain understudied.

similarly studied the influence of outcome-oriented compared to process-oriented goals on performance. For example, Zimmerman and Kitsantas (1999) gave high school girls the task of combining a series of kernel sentences into a single nonredundant sentence. Those assigned to an outcome goal (focus on minimizing the number of words in the combined sentence) performed worse in their post-test writing revision skill compared to those assigned to adhere to a process goal (focus on a 3-step method for combining sentences). In one intervention conducted on obese adults using financial incentives for weight loss, emphasizing the goal of the desired outcome (to lose weight) led to less weight loss improvements compared to emphasizing the desired effort or behavior (to eat healthily; Mahoney 1974). Referring to extrinsic incentives, Condry and Chambers (1978, p. 66) posited that “rewards often distract attention from the process of task activity to the product of getting a reward.”

Integrating the logic of the above perspective, I hypothesize that different incentive currencies are likely to yield different degrees of attention to one end of the “compensation-reward” continuum or the other. And, in particular, individuals’ priorities will tend to shift toward either the outcome of securing compensation (in which the incentive is viewed as entitlement or due payment) or the process of engaging in the effort stream (in which the incentive is viewed as simply a reward for doing something virtuous). I separately evaluate three such currencies below.

### 2.3.1 Cash Incentives

As delineated in Section 2.1, cash is intuitively appealing precisely because it possesses so many advantages—at once universal, fungible, and flexible. These same characteristics that make cash compelling as a reward, however, also render it incredibly extrinsic. Of all incentives, cash is perhaps the furthest removed from the domain of effort and the most likely to feel akin to an external

inducement (or even bribe, in extreme cases). I posit, therefore, that it also serves as the currency most likely to be associated with—indeed, intertwined with—compensation.

Incentive systems that feature cash may pose the most threat to intrinsic motivation, as cash represents the ultimate example of a reward that is denominated in a currency unrelated to any type of effort. Using the context of loyalty programs, Kivetz (2005) found that people tend to prefer rewards that are congruent with (*i.e.*, related to) the required consumption effort as a means of coping with their reactance to marketing promotions. Choosing effort-congruent rewards (*e.g.*, earning a music CD for reviewing songs) reaffirms autonomy by enabling individuals to perceive their actions as intrinsically motivated rather than externally influenced.

Denominating incentives in cash, more so than in other currencies, should tend to focus people on attaining their compensation—a concern that invariably comes at the expense of truly engaging in a given effortful task. As a result, I expect that an individual faced with the prospect of earning cash will care more about surpassing the minimum effort threshold (as a means of guaranteeing the reward) over choosing to immerse him/herself in the activity itself.

### 2.3.2 Noncash Incentives

Another type of incentive worth investigating consists of noncash rewards—by these I refer specifically to tangible rewards that include luxury prizes or in-kind hedonic items (*e.g.*, gourmet chocolates or movie tickets). This category merits further examination for several reasons. First, such motivators are frequently deployed in the marketplace and workforce.<sup>12</sup> Rather than offering higher pay for better performance, companies often offer employees prizes in the form of travel packages, restricted-use gift cards, products and services, and other benefits (*e.g.*, Culpepper and

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<sup>12</sup> Albeit a practice due more to lay intuition rather than based on empirical evidence.

Associates 2008; Famulari and Manser 1989; Kivetz and Simonson 2002a; Kivetz, Urminsky, and Zheng 2006). Eighty-three percent of firms in one survey reported using rewards such as merchandise or travel items with their sales personnel (Incentive Federation 2005), and 55% of participants in another survey pointed to noncash awards as a “vital component of sales performance management” (Aberdeen Group 2013).

Second, beyond their widespread use, noncash tangible rewards can possess an advantage over their monetary counterparts in a variety of circumstances. When asked to explicitly choose between the two, a substantial segment of consumers—“hyperopic” individuals who feel a need to precommit to indulgences—preferred hedonic rewards to cash prizes of equal or greater value (Kivetz and Simonson 2002b). Further, because many people perceive choosing, acquiring, and consuming luxuries as more guilt-invoking and harder to justify (Dhar and Wertenbroch 2012; Kivetz and Simonson 2002b; Okada 2005; Prelec and Herrnstein 1991), the presence of greater effort requirements in reward programs tends to justify and enhance choices of noncash hedonic rewards over cash-equivalent incentives (Kivetz and Simonson 2002a). Kivetz and Zheng (2017) similarly demonstrated that the greater need to justify hedonic (vs. utilitarian) consumption means promotions have a greater positive influence on purchase likelihood of hedonic luxuries compared to necessity products. Drawing on this asymmetric justification effect, Jeffrey (2009) found in one study that tangible prizes (*e.g.*, a 5-minute massage coupon valued at \$10) caused participants in a laboratory study to improve by more points on a word game task relative to equivalent cash awards (*e.g.*, \$10).

Although the kinds of noncash tangible rewards described above are objectively extrinsic (*i.e.*, stemming from outside the focal behavior), because they are not denominated in the universal currency that is cash, I suggest that they may nevertheless be perceived as less extrinsic *relative to* cash incentives. That is, when confronted with the prospect of earning a \$10 voucher redeemable for a

massage or fancy chocolates (as opposed to being paid the equivalent amount in dollars), people are likely to tend to treat the incentive as less of a compensation or an exchange of labor but instead as simply a reward—an indulgence they have earned for working hard.

### 2.3.3 Self-Rewards

Lastly, I consider a novel type of incentive currency that I view as furthest from the compensation end of the proposed continuum—namely, *self-rewards*. In my paradigms and throughout this dissertation, this term is used to refer to rewards that people define and provide for themselves, at their own cost of time or money, in return for good behavior (such as reaching a prescribed goal). Because the incentive in this case is entirely self-imposed rather than provided by an external source, as with both cash and noncash tangible incentives, it is likely to be viewed even less as a form of “compensation.” Hence, individuals should tend to ascribe their actions to the focal behavior more than to attainment of the prize.

Although I leave the precise details of the reward fairly open-ended to accommodate preference heterogeneity, I specifically asked participants in my experiments to define indulgences—which could be either items or experiences—that they would otherwise feel guilty about, and hence attempt to avoid, consuming. To put it more concretely, an individual could make a promise to him that for every week he walks a certain number of steps, he will award himself by spending a night out with friends—an indulgence he would otherwise feel guilty about. As Kivetz and Simonson (2002a,b) found, people who suffer from excessive overcontrol (hyperopia) in certain aspects of their lives, and who tend to deprive themselves of indulgence, are more likely to precommit to such indulgence when given the opportunity. In this respect, a self-reward incentive system may act as one such “precommitment contract.” By recognizing and attempting to bridge instances of

intrapersonal myopic (shortsighted) and hyperopic (farsighted) behavior, self-rewards can potentially overcome the “one step forward, two steps back” problem that externally funded financial rewards often suffer from.

The incentive scheme I have designed and will later test is inspired by—but in many ways distinct from—the kinds of self-regulation techniques and strategies employed by previous research in behavior therapy and clinical psychology. Results attesting to the efficacy of self-reinforcement systems in this literature (for review, see Bandura 1976) have been mixed. A handful of studies on the influence of self-administered consequences (in comparison to externally-generated rewards) on outcomes such as weight loss and classroom behavior has shown guardedly optimistic results (*e.g.*, Bandura and Perloff 1967; Humphrey, Karoly, and Kirschenbaum 1978; Mahoney 1974; Mahoney, Moura, and Wade 1973; but *cf.* Castro and Rachlin 1980; Felixbrod and O’Leary 1974; Greiner and Karoly 1976). Notably, however, the paradigms used in this space have largely focused on the study of children’s reinforcement schedules, on the use of financial incentives within token economies, and on the comparison of self-administered rewards to a no-reward (or delayed-reward) control. For example, in one intervention (conducted by Mahoney 1974) frequently cited as evidence for the effectiveness of self-reward, participants were instructed to award themselves portions of their own monetary deposit (\$35), left at the beginning of the program, based on their weight loss progress.

To date, I do not know of any studies that have systematically examined the efficacy of self-rewards (*i.e.*, indulgent rewards both self-defined and self-administered by individuals at their own cost) relative to cash incentives on motivating and sustaining chronic habits. The empirical tests I conduct in this chapter attempt to address this gap.

## **2.4 Consequences of Self-Reward on Behavior Change**

A foremost objective of this chapter is to experimentally assess the motivational effectiveness of a self-reward incentive program relative to other (arguably more “default”) systems based on cash and tangible noncash rewards. In the three studies that follow, I tested whether an indulgent self-reward—again, defined and administered by individuals at their own cost—contingent on reaching a performance goal can, more so than cash incentives, prompt greater engagement in a “virtuous” activity (*e.g.*, walking more) and ultimately enact lasting (or at least less ephemeral) behavior change.

If indeed there exists some correspondence between the types of incentives outlined in Section 2.3 and the extent to which they are interpreted as “compensation” versus “reward,” we can generate a number of testable predictions for performance during and after the intervention. A key supposition here is that the effects of a given incentive will not reflect equally across all relevant metrics. Rewards that are perceived as more externally induced and thus more like compensation (*e.g.*, cash) may motivate people to work hard and do better on some dimensions but perform worse on others. This has several implications for goal pursuit. Specifically:

(i) *Goal attainment.* Whether or not people meet their goals or achieve a certain performance standard is a common (if not dominant) primary outcome that interventions typically attempt to target. On this metric, I predicted people incentivized with cash to perform quite well over the course of the reward program. Precisely because their compensation depends on reaching a minimum effort threshold (*e.g.*, walking 50,000 steps a week), they should tend to meet their goals frequently—perhaps more so than those incentivized with self-rewards of their own definition and provision.

(ii) *Engagement.* However, equally informative and perhaps more interesting measures to consider are ones that speak to the process of goal pursuit during the intervention. In particular, to what extent are people engaged in the effortful activity itself: walking more steps, visiting the gym more times, and spending more time during each visit? Here I anticipated self-rewards—which are



arguably less susceptible to crowding out effects—to stimulate greater engagement, while cash-based incentive programs would engender more demotivating effects overall.

(iii) *Persistence and habit formation.* Finally, we can ask whether people continue to persist in their efforts once the reward program concludes (*i.e.*, when extrinsic incentives are withdrawn) or whether their progress evaporates over time. Because self-rewards lie toward the “reward” as opposed to “compensation” end of the continuum introduced in Section 2.3, I expected these incentives to produce greater persistence and habit formation during this period. By contrast, cash incentives (and the accompanying focus on compensation they bring to mind) will tend to provoke a dramatic decrease in performance, as people no longer have a “reason” to exert significant effort. Tangible noncash rewards, due to their combined monetary and nonmonetary character, are likely to fall somewhere in between.

## 2.5 Overview of Studies

I tested the propositions delineated in Section 2.4 in a series of three incentive-compatible, longitudinal field experiments that compared the effects of self-rewards against primarily cash incentives (and noncash hedonic prizes in one study) on increasing regular physical activity.

Sedentarism is a major contributing risk factor to adverse health outcomes like obesity, hypertension, and cardiovascular disease (*e.g.*, Tudor-Locke and Basset 2004). To assess the effectiveness of different incentive structures in targeting this issue, I used a pedometer-based intervention in Studies 1 and 2 to measure how many steps participants walk, a technique that has been used in many health-related studies, both cross-sectional and longitudinal (*e.g.*, Croteau 2003; Richardson et al. 2008; Rooney et al. 2003; Sequeira et al. 1995; Tudor-Locke et al. 2004). Compared to more traditional methods relying on questionnaires or “food diary” surveys, pedometers allow

both participants and researchers to more accurately and readily observe their activity levels from day to day. Study 3 used a smartphone fitness app to log and track gym activity.

Participants across the three studies consisted of Columbia University students (drawn almost exclusively from the undergraduate population) recruited from the Behavioral Research Lab at Columbia Business School. I enlisted between one to three research assistants to help in the role of experimenter, which involved weekly contacts with each participant (*i.e.*, scheduling appointments for check-in sessions, administering online surveys, and distributing treatment-specific rewards during the incentive period). The research assistants had no advance knowledge about the specific nature and direction of the experimental hypothesis, although they could not be blinded to condition due to the nature of the intervention. Sample sizes were determined in advance.

Each study encompassed two major stages, or periods (see Figure 1 for a flow of participants through enrollment, intervention, and post-intervention). In the first stage, participants were recruited at the university behavioral lab and asked to self-monitor their walking activity (Studies 1-2) or gym attendance and activity (Study 3) for a month. I randomly assigned participants during enrollment into a control and treatment groups; they had the chance to be rewarded on a weekly basis during the next three weeks comprising the incentive period. Those in the control group received additional compensation (in cash) regardless of how they performed, whereas those in the treatment arms qualified for a bonus reward contingent on meeting a predetermined goal. Following the intervention window, participants were informed that the study was over and that they would no longer need to check-in at the lab every week (in addition, all external compensation would be discontinued). A post-incentive period, lasting approximately one month, then commenced in which I continued to unobtrusively monitor and gauge performance.

A central objective of the present research is to analyze the influence of different reward programs in the context of personally relevant and naturalistic settings by studying the kinds of

repeated decisions that people face in their everyday lives. Taken together, the findings across the three field experiments delineated in this chapter suggest that contingent self-rewards, where individuals are allowed to define and administer their own rewards, can be a viable tool in galvanizing positive behavior change.

## **2.6 Study 1: Incentives to Walk More**

### 2.6.1 Design

Study 1 was a pedometer-based intervention I launched in the winter of 2015 that encouraged people to walk more on an everyday basis. I expected that participants to average more steps each week in the presence (vs. absence) of contingent incentives. Notably, self-imposed rewards should yield greater sustained performance than cash incentives, with participants exposed to the self-reward treatment showing the most long-term (*i.e.*, as observed in the post-incentive period) improvement. Moreover, I anticipated that this pattern would deviate from lay intuition: People will predict, on the contrary, that exercise incentive contracts featuring cash incentives are more likely to be successful and effective (both in the short- and long-term) than contracts based on self-rewards.

Before elaborating on the procedural details, I first highlight and discuss some key design features of the intervention.

*Sample and participant flow.* A power analysis using Charness and Gneezy (2009) as a guideline indicated that, with 40 participants per group, I would be able to detect a minimum effect size of .63 standard deviation in daily steps walked (assuming 80% power and an  $\alpha$  of .05). As a buffer against anticipated attrition, I aimed to recruit at least 25% more participants in each cell.

Participants in Study 1 consisted of 231 Columbia students recruited from the Behavioral Research Lab at Columbia Business School (average age = 22.4 [ $SD = 4.2$ ], 35% male, average BMI = 26.2 [4.0]). I randomly assigned individuals to one of four conditions: a no-incentive control and three incentive treatment arms. Figure 1 illustrates the overall flow of participants in this study.

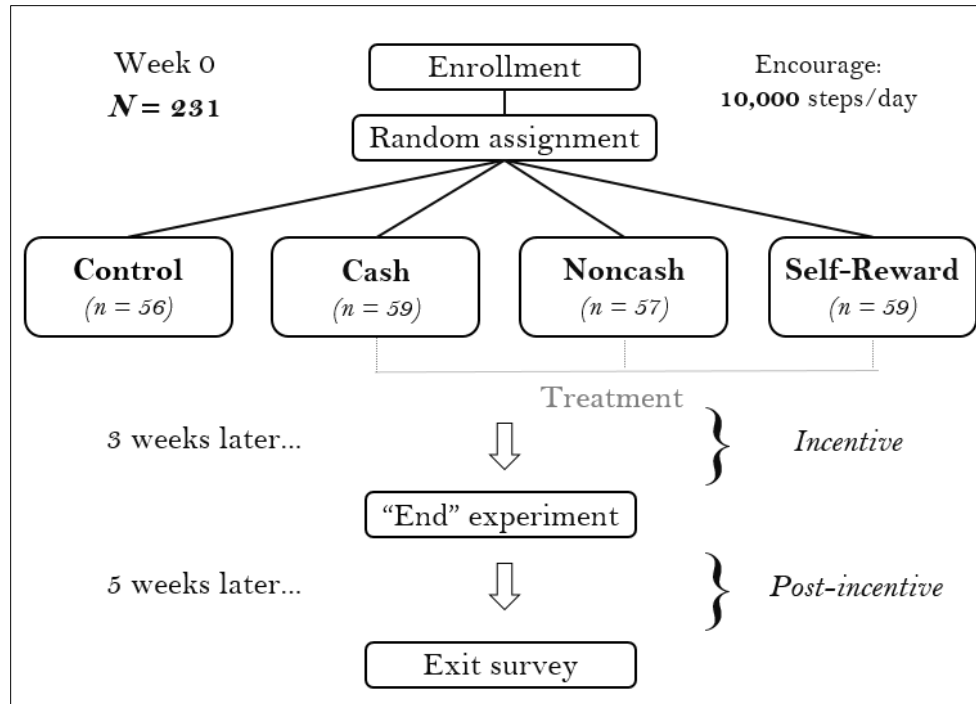


Figure 1: Flow of participants (Study 1).

*Incentive period time horizon.* A meta-analysis of the intervention windows of pedometer-based studies (Richardson et al. 2008) found a range of four weeks to one year, with a median of 16 weeks. In my experiment, I set the intervention (*i.e.*, intervention) period to last four weeks in total (including the first week of recruitment and enrollment), followed by another four weeks of observation without externally-imposed incentives. I reasoned that for the purposes of this experiment, a month-long intervention allowed for ample time to capture individuals' repeated behaviors without cutting into extended breaks in the academic calendar, as well as to give

participants an opportunity to develop walking habits that could potentially persist once the incentive period concluded.

*Target effort expenditure.* I imposed a target effort threshold that was fixed across all participants, since allowing them to define their own goals would have made it hard to separate any effect of individual differences in goal setting on performance from the pure effect of incentives. How many steps per day are enough? Existing work featuring pedometers have converged on a benchmark of about 10,000 steps per day as the “active amount” standard (Croteau 2004; Rooney et al. 2003; Tudor-Locke and Basset 2004). To decrease the chances of obtaining floor or ceiling effects, I chose a threshold that exceeds participants’ average step count but not so high as to be disincentivizing due to the perceived infeasibility of meeting the goal (leading to a “what-the-hell” effect, *e.g.*, Cochran and Tesser 1996). To that end, I set a minimum step goal of 50,000 steps total per week during the incentive period. Note that this built-in flexibility effectively allows individuals two days of rest, permitting them extra “slack” in goal pursuit (see, *e.g.*, Sharif and Shu 2017).

*Reward interval.* I set both performance thresholds and rewards at the weekly level: Participants were instructed to check-in to the lab every week (*i.e.*, on a day exactly seven days from their first session) for a total of four times to collect a small attendance fee as well as any rewards coinciding to their incentive condition.

*Measurement tool.* To reliably measure behavior not only at one point in time but over the course of (and indeed following) the intervention program, I needed an instrument that was objective (*i.e.*, not reliant on self-reports), comparable across individuals, and as inobtrusive as possible. Therefore, in lieu of a wearable device such as a Fitbit, I used a pedometer smartphone

application called Moves<sup>13</sup> to track people’s step count throughout the study. I had all participants install the app and carry their smartphones on their person as often as possible.<sup>14</sup>

While mobile fitness tracker apps (including Moves) can often imperfectly capture individuals’ true behavior, several features of Moves in particular afford some advantages over pedometer devices or similar apps. First, Moves is free to download for both iPhones and Android smartphones, models that cover the vast majority of our sample, and runs in the background (requiring no user input or interaction) so long as tracking is turned on. Second, it uses a combination of the mobile phone’s built-in accelerometer (motion-based) as well as GPS (location-based) data to record more accurate measurements than apps that use the accelerometer alone. To further assess accuracy, I conducted a pretest (see Appendix A2 for details) where I found that the app was quite accurate in comparison to a wearable Fitbit device (and if anything, slightly underestimated rather than overestimated steps).

Third, Moves has a minimalistic design (see Figure 2) that limits the display to step count (and location) data, reducing the likelihood that participants could be influenced by app-specific factors stemming from extraneous content, social comparison, or any implicit “nudges” (*e.g.*, information about sleeping and dietary habits, leaderboards or other social cues that could lead to spillover effects, etc.).

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<sup>13</sup> Unfortunately, the app has since been shut down (as of 2018).

<sup>14</sup> As it turned out, smartphones served as a constant companion among millennials (which made up my subject pool).



Figure 2: Screenshot of Moves app interface (Studies 1 and 2).

Fourth, the app can reliably differentiate between times when participants are walking or running (in which case steps are counted) and when they are on transport (in which case steps are not counted). Fifth, users cannot retroactively enter or alter their recorded step data, nor can they easily accumulate a large number of steps by, for instance, flexing the arms while holding the phone to essentially cheat or “game” the system. Finally, Moves kept a complete and running history of a given individuals’ steps since installation of the app, along with an online user interface synced to users’ accounts from which step data can be readily downloaded. By assigning each person a unique alias account tied to their phone, this allowed me to nonintrusively monitor participants’ walking activity online so long as they carried their phone on their person (*e.g.*, in a pocket, jacket, or bag)—even when the experiment was ostensibly over.

*Outcomes.* The primary outcomes of interest for each individual consisted of, for both the intervention and post-incentive period, (*i*) the total number of steps walked each week, as measured by the Moves app, and (*ii*) an indicator for whether the step goal was met (or exceeded) that week.

*Conservative control.* To ensure that a difference in absolute payment does not drive any treatment effect, those assigned to the control group received the same amount of compensation (but independently of their step count) as those in the cash incentive arm who earned the bonus reward. Previous literature has documented increases in physical activity, consistent with a mere measurement effect, with the use of a pedometer alone (*e.g.*, Croteau 2004). In the present design, any effects of the treatment groups I detect would capture differences over and above any beneficial effects of self-monitoring.

*Enforcement policy.* Incentive structures are liable to unravel without a suitable enforcement mechanism to discourage noncompliance. To diminish this concern, I imposed an enforcement policy whereby failure to redeem a reward would result in its forfeiture to a randomly selected charity or foundation from a list of several organizations. To increase the chances that such a donation “threat” would indeed be perceived as undesirable and threatening from participants’ perspectives, I selected social and political organizations with a diverse—and hence more likely contradictory—range of goals. Notable among these was the National Rifle Association, an organization rated as highly disliked by the vast majority of Columbia college students (as confirmed in a separate pretest; see Appendix A3 for respondent evaluations and a list of nonprofits used).

## 2.6.2 Method

*Recruitment and enrollment.* I recruited participants from the Columbia student lab pool during a 5-day (Monday to Friday) window as part of an advertised month-long study about walking, ostensibly to provide feedback on a pedometer app. To qualify for the study, all participants had to own an iPhone or Android smartphone compatible with the Moves app, which I used to track daily



walking activity. I instructed eligible participants to download the application on their phone in advance of their first appointment.

During the initial session, I randomly assigned participants to one of four conditions (*i.e.*, a control and three treatment arms). I first administered an intake survey that measured baseline fitness habits and interests (including perceived physical activity levels) to help account for some individual characteristics. Participants read an overview of the study, reiterating that their participation meant that they would commit to attend the next three weekly sessions. Each of these sessions would act as a 5-minute check-in where they would receive a \$3 show-up fee (see Appendix A4 for full instructions). I then asked participants a series of questions about their exercise and physical activity levels, habits, and routines (*e.g.*, Godin 1985), followed by their evaluations ( $1 = \textit{Dislike very much}$ ;  $7 = \textit{Like very much}$ ) of a series of 18 randomly ordered nonprofit organizations, including the National Rifle Association (see Appendix A5).

Next, I informed people about the “pedometer program” they would be enrolling in as part of the study. Specifically, they read:

To stay active, researchers and health professional experts (including the U.S. surgeon general) recommend walking **at least 10,000 steps per day**. Many studies have also shown that people who increased their daily step count to around 10,000 steps tended to experience several health benefits (*e.g.*, Tudor-Locke & Basset, 2004). To help improve your health by walking more on a daily basis, you will be participating in a program for the next week. This program will use a **pedometer**, which tracks the number of steps you walk each day.

Participants further learned that over the course of three weeks, they would be asked to monitor their steps using Moves, a smartphone app that uses accelerometer and GPS data to track step activity. They were then instructed to get the attention of the experimenter, who would create and set up an alias account for them. The purpose of the alias account, they read, is to connect their individual Moves data to a randomly generated account that can’t be traced back to their identity; in this way the researchers would be able to verify their pedometer activity during the study without accessing any personal data or accounts. To preserve participants’ privacy, I generated a batch of unique emails to serve as alias accounts in advance. At this point the experimenter randomly

assigned each participant one of these pre-generated accounts (with a username and password) and linked it to the app on that individual's phone; this allowed me to remotely and unobtrusively monitor daily activity on the Moves server.

Upon setting up their Moves account, all participants were encouraged to walk at least 10,000 steps per day, after which they saw instructions specific to the condition they were randomly assigned (see Appendix A4 for detailed instructions). Participants assigned to the *control* (*i.e.*, self-monitoring only) group read that they would, as part of the program, also receive \$20 (in cash) at the end of each week. Hence, a weekly reward would be distributed to each participant in this condition but, crucially, would not be contingent on his/her expended effort (*i.e.*, walking a certain number of steps). Over the course of the incentive period, control participants could receive net earnings of \$69 in cash.<sup>15</sup>

Those assigned to one of the three treatment arms earned a bonus for each week that they attained a target (minimum) step goal of 50,000 steps. Specifically, those in the *cash* incentive condition read that if they “meet or exceed the target goal of 10,000 steps per day for at least 5 days (out of 7) OR 50,000 steps total over 7 days,” they would earn \$20 in cash as a bonus reward at the end of each week. Thus, these individuals could earn a maximum net earnings of \$69 if they successfully met the goal every week thereafter and attended the check-ins.

In the *noncash* reward condition, participants read that if they met or exceeded the target step goal (the same goal as in the cash group), they would earn a bonus reward consisting of their choice of one item, with an equivalent retail value of \$20, from a predetermined 7-item gift catalog. The displayed catalog included an assortment of indulgent, hedonic tangible prizes such as a box of gourmet chocolates, a gift card to a local coffee shop (frequently visited by Columbia students), two

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<sup>15</sup> This figure does not include the \$5 Amazon gift card participants could earn for completing the post-incentive debriefing final survey.

movies tickets, and a gift card for a “Spa Day.” (I chose these items based on open-ended responses provided by a separate sample of lab participants in a pretest.) Participants then indicated which reward they would prefer from the menu provided.<sup>16</sup>

Finally, those in the *self-reward* condition read that if they met or exceeded the target step goal, they would earn their choice of a reward they have defined and will give themselves.

Specifically, I presented them with the following instructions:

[T]his reward should be anything that you find **pleasurable but not really necessary**—something you would like to “indulge in” more but would normally feel guilty about indulging in.

This reward can be either a **tangible item** (e.g., an allowance you give yourself to spend on a good or service) or an **experience** (e.g., a few hours to read a book, take a long walk, or catch up on television, etc.). Most importantly, it should be something you feel you don’t currently afford for yourself as much as you would like—some indulgence you really feel is “missing from your life.

The reward you define needs to be **within your ability and resources** to give yourself **within the next 7 days from today.**

Participants then described a reward satisfying the criteria described above. I added that they would be free to define a different reward for future weeks but to first describe a reward for the current week. Unlike the control, cash, or noncash conditions, the cost of this self-defined, self-administered reward is borne fully by the participant rather than the program sponsor.

After learning about the condition-specific incentives, I implemented the enforcement policy by informing participants what would happen should they fail to redeem their reward each week. I stressed to everyone the importance of attending the next weekly check-in (which would take place in exactly seven days) to claim their rewards. In particular, those in the control group read that if they failed to claim their \$20 payment, that \$20 would be forfeited to a “randomly selected nonprofit organization” from the list of nonprofits they rated earlier (these 18 organizations were displayed again on the same page). Among those assigned to the cash incentive treatment arm, I explained that only in the event that they successfully met the target step goal but fail to claim the \$20 bonus

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<sup>16</sup> If they so desired, these participants had the option of switching their reward choice from week to week.

reward would that \$20 be forfeited to one of the randomly selected nonprofits from the same list. Importantly, no donation would be enacted if they did not meet the goal. Participants in the noncash reward condition read similar instructions as those in the cash incentive group, except that the forfeiture (should they meet the goal but fail to claim the bonus) would consist of their chosen reward from the catalog worth approximately \$20. Finally, in addition to emphasizing the need to attend the weekly sessions, I informed participants assigned to the self-reward treatment arm that during these sessions they would be asked to write about their experience of consuming the reward they defined for themselves if they met the goal. To verify reward redemption, I further instructed participants that should they qualified for the bonus self-reward, they must submit documentation that they either consumed or plan to consume the reward they defined for that week (*e.g.*, a picture or receipt of the experience or product) during each check-in.

After seeing the enforcement policy terms, all participants proceeded to what appeared to be a loading screen intended to simulate a random selection of one of the organizations by the system. In reality, the National Rifle Association (NRA) served as the chosen nonprofit for everyone. Participants were run separately or in separate rooms, limiting the possibility of any social spillover effects. I presented this “threat” only to incentivize people to truly reward themselves should they earn it and did not actually donate to the NRA (a deception I revealed during debriefing at the conclusion of the study—that is, after the post-incentive period).

Finally, participants provided measures of BMI (calculated based on height and weight<sup>17</sup>), and relevant individual differences consisting of trait hyperopia, indulgence guilt, self-efficacy, and general self-control (see Appendix A6 for scale items), followed by basic demographic information. After being thanked and compensated for their participation, they received from the experimenter a

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<sup>17</sup> Participants self-reported their own height and used a scale to measure their weight. A malfunction of the scale midway through the experiment prevented me from drawing accurate conclusions with respect to meaningful changes in BMI.

packet containing instructions and reminders corresponding to their assigned condition, as well as an activity log for the next week where they were asked to write down their step counts (as recorded by the Moves app) along with any other exertion-intensive exercises they engaged in (see Appendix A7). The experimenter instructed them to take the packet home and bring it with them to the next appointment, where they would turn it in. Participants were also told to expect weekly emails reminding them to track their progress and collect their rewards by attending each check-in session.

*Incentive period.* Over the next three weeks—that is, the incentive period—, participants monitored their walking activity using the Moves app and turned in a weekly exercise log of their daily step count and activity to the experimenter at the end of each week. During each weekly check-in, they claimed the rewards corresponding to their assigned incentive condition, collected a \$3 additional cash payment simply for showing up, and received a new packet to take home with an updated exercise log.

*Post-incentive period.* The experiment officially concluded from the participants' perspective after three weeks following the first session. All extrinsic rewards were discontinued, and participants were told that they will no longer receive any additional rewards, weekly email reminders, or have the “threat” of charity donations as an enforcement policy. Notably, however, the experimenter instructed everyone to keep their Moves account active for the foreseeable future until notified otherwise for “data calibration” purposes.<sup>18</sup> Unbeknownst to participants, I continued to remotely access and monitor their daily walking activity and performance over the course of the next five weeks.

Finally, following the post-incentive period, I administered one final, 10-minute survey that participants could fill out online remotely in exchange for a \$5 Amazon gift card to be delivered

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<sup>18</sup> As part of the cover story, the experimenter told participants that the data from their phone would take a while to sync properly to the online interface. Hence, it would be important to refrain from making any changes to their account.

electronically upon completion. The exit survey included a memory test of what rewards they were exposed to as part of the pedometer study as well as a number of individual difference measures encompassing judgment (satisfaction, perceived success of achieving goals, perceived difficulty and effort expenditure, and situational intrinsic motivation) and behavior (changes in steps/day). In the last set of questions, I presented the three incentive program contracts (cash, noncash, and self-reward) and asked participants to provide their preferences for each reward program under joint evaluation (see Appendix A8 for the full instructions). I distributed the survey link to all participants who first enrolled in the program, even if they attrited during the incentive period; the response rate was high (recovering 81% of the initial sample) and did not differ in proportion across the four incentive conditions.

### 2.6.3 Results

*Randomization check.* Comparisons of relevant self-reported characteristics (e.g., frequency and baseline levels of physical activity, desire to improve activity levels, chronic traits, etc.) indicated that random assignment achieved sufficient balance across the four incentive groups; no measure differed significantly by condition (all  $ps > .1$ ; see Table 1). Note that only 32% of our sample consisted of Android users (the rest used iPhones); device type did not substantially influence the main results.

	<b>Control</b>	<b>Cash</b>	<b>Noncash</b>	<b>Self-Reward</b>	<b>Aggregate</b>
Perceived physical activity (1-4)	2.62 (.12)	2.57 (.11)	2.54 (.12)	2.52 (.11)	2.56 (.06)
Frequency of “working up a sweat” (1-3)	2.05 (.11)	2.00 (.10)	2.04 (.10)	1.93 (.09)	2.00 (.05)

Consistency of exercise routine (1-7)	3.87 (.26)	4.16 (.23)	3.78 (.26)	3.62 (.22)	3.86 (.12)
Desire to exercise more (1-7)	5.38 (.14)	5.43 (.11)	5.63 (.12)	5.59 (.13)	5.51 (.06)
Importance of more exercise (1-7)	5.38 (.17)	5.26 (.17)	5.37 (.16)	5.38 (.17)	5.35 (.08)
Self-efficacy (1-7)	3.90 (.06)	3.86 (.06)	3.91 (.06)	3.82 (.07)	3.87 (.03)
Self-control (1-5)	3.13 (.09)	3.10 (.07)	3.14 (.08)	3.18 (.09)	3.14 (.04)

*Table 1:* Baseline summary statistics (Study 1). Standard errors are in parentheses below the means for each incentive condition. The scales used for each measure are indicated in parentheses.

*Attrition.* I lost around 14% of the original sample to follow-up over the course of the incentive period, defined as those who failed to show up to an in-person session at the lab. I excluded participants who attrited during the incentive period, although including those who dropped out during the first three weeks did not substantially change the results. Considerably more people attrited during the post-incentive period, defined as those whose Moves accounts recorded no activity, indicating that they had stopped using the app (or had disconnected their alias account). Although attrition rates in both periods did not vary by experimental condition in any week during the entire observation window (see Appendix A9), a limitation is the extent to which I can confidently interpret the results during the later weeks (*e.g.*, weeks 7 and 8) of the post-incentive period. To further address this concern, I conducted a robustness check following the recommendation of Dumville and colleagues (2006), in which I separately compare the baseline characteristics across incentive conditions among participants lost to follow-up (see Appendix A10). None of these measures differed as a function of incentive condition (all  $ps > .1$ ), suggesting that those who attrited did not systematically differ by treatment group from those who did not.

*Self-rewards defined.* What kinds of rewards did participants define for themselves? Open-ended responses (see Appendix A11 for a tabulation of sample rewards) indicated that many individuals defined rewards that were not costly in terms of money but rather time (*e.g.*, catching up on a television series, reading a book for fun, or sleeping in). Participants' elaboration of their reasoning process for why they defined the specific reward they wrote revealed that such rewards were indeed perceived as guilt-evoking and constituted consumption items and experiences which they did not usually afford for themselves.

*Goal attainment.* Figure 3 shows the proportion of participants who met (or exceeded) the step goal (50,000 steps) for each incentive condition from week to week. Weeks 1 through 3 comprise the incentive period, while the remaining weeks comprise the post-incentive period.

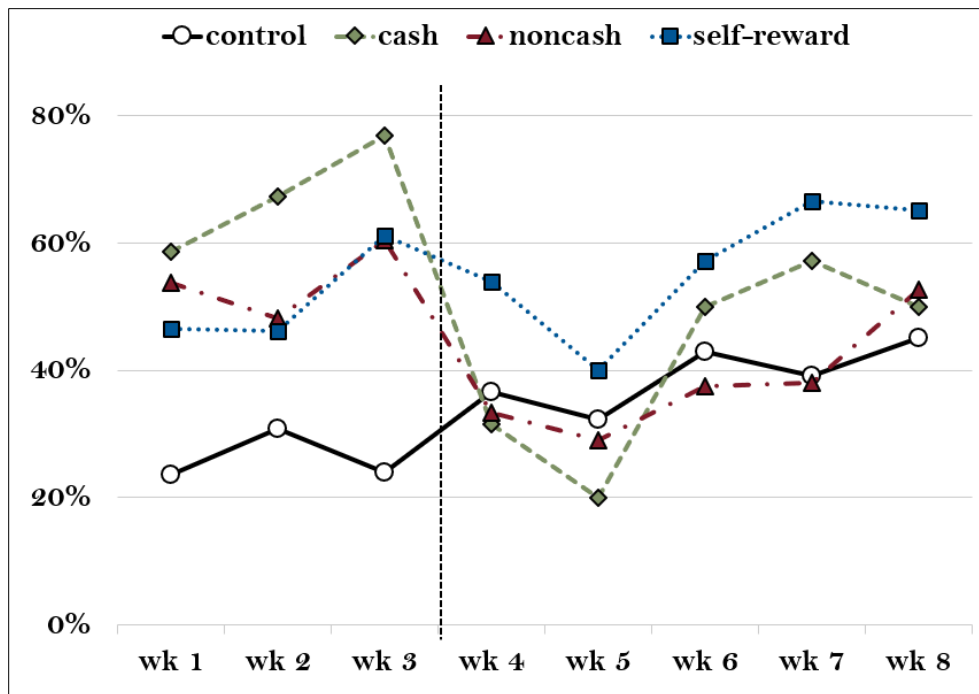


Figure 3: Percentage of participants who met the step goal (50,000+ steps) each week (Study 1). The vertical dotted line denotes the transition window from the incentive to post-incentive period.

Turning first to the incentive period (weeks 1-3), we can discern a greater overall propensity to meet the goal in the cash condition relative to not only the control but the two treatment conditions as



well. In week 1, compared to 24% in the control, 59%, 54%, and 47%, in the cash, noncash, and self-reward groups, respectively, walked at least 50,000 steps total ( $\chi^2(3) = 16.79, p = .001$ ); this difference was driven by the overall effect of the three treatment arms over the control. For example, more participants in the self-reward condition met the goal relative to control levels ( $B = 1.04, SE = .41, \chi^2(1) = 6.30, p = .01$ ), as was true for the cash and noncash groups. I observed a similar pattern for weeks 2 and 3 of the incentive period, where the relative advantage of monetary incentives became more readily apparent (week 2: 31%<sub>control</sub> vs. 67%<sub>cash</sub> vs. 48%<sub>noncash</sub> vs. 46%<sub>self-reward</sub>;  $\chi^2(3) = 15.15, p = .002$ ; week 3: 24%<sub>control</sub> vs. 77%<sub>cash</sub> vs. 60%<sub>noncash</sub> and 61%<sub>self-reward</sub>;  $\chi^2(3) = 27.18, p < .001$ ). Averaging across the three weeks of the incentive period, 68%, 54%, and 51% of those in the cash, noncash, and self-reward groups met (or exceeded) the prescribed 50,000 total steps each week, respectively, compared to only 26% in the control.

However, as soon as the post-incentive period began, a conspicuous change in behavior occurred. During week 4, compared to 37% in the control, 32% and 33% among those in the cash and noncash incentive conditions, respectively, met the goal. By contrast, 54% of participants assigned to the self-reward treatment arm did. Only participants in this group fared (marginally) better on this measure compared to the control ( $\chi^2(1) = 2.4, p = .12$ ). Those in the cash and noncash conditions performed no differently than their control counterparts and performed worse than participants in the self-reward treatment (cash:  $\chi^2(1) = 3.8, p = .05$ ; noncash:  $\chi^2(1) = 3.3, p = .07$ ). Looking several weeks beyond into the post-incentive period, participants who rewarded themselves during the intervention continued to maintain fairly high levels of goal attainment relative to the control, while no such advantage appeared for those who were incentivized with cash or noncash hedonic rewards.

*Steps walked.* Given the continuous nature of the dependent measure, a perhaps more instructive outcome (beyond the binary metric of goal attainment) consists of how *much* people

walked over the course of the intervention and thereafter. Figure 4 displays the total number of steps participants walked each week on average for each incentive condition.

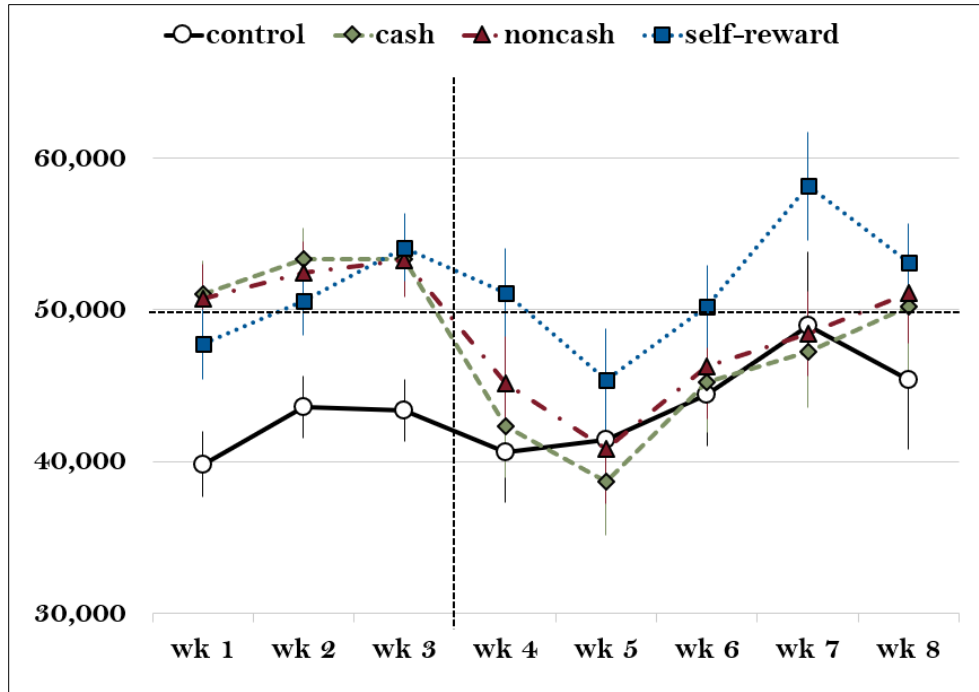


Figure 4: Average total steps walked each week (Study 1). The vertical dotted line denotes the transition window from the incentive to post-incentive period. The horizontal dotted line denotes the prescribed goal of 50,000 steps per week. Error bars are standard errors ( $\pm 1$  SEM).

During the first week of the incentive period, the number of total weekly steps walked differed as a function of incentive condition ( $M_{\text{control}} = 39,807$  steps [ $SD_{\text{control}} = 15,859$ ]<sup>19</sup>;  $M_{\text{cash}} = 51,057$  steps [16,468];  $M_{\text{noncash}} = 50,707$  steps [17,031];  $M_{\text{self-reward}} = 47,717$  steps [17,795];  $F(3,221) = 5.36, p = .001$ ). Planned contrasts revealed that compared to the control group, each of the incentive treatment arms yielded a greater step count (cash:  $t(221) = 3.56, p < .001$ ; noncash:  $t(221) = 3.38, p = .001$ ; self-reward:  $t(221) = 2.50, p = .01$ ). Combined, the three treatment conditions lead to more steps walked than the control ( $t(221) = 3.84, p < .001$ ). The same pattern emerged in the next two weeks of the incentive period (see Appendix A12 for a summary of these results).

<sup>19</sup> Standard deviations are henceforth denoted in closed brackets following their corresponding means.

Averaging across the incentive period (weeks 1-3), the amount of steps walked varied by condition ( $M_{\text{control}} = 41,463$  steps [ $SD_{\text{control}} = 12,704$ ];  $M_{\text{cash}} = 53,013$  steps [13,918];  $M_{\text{noncash}} = 52,407$  steps [14,116];  $M_{\text{self-reward}} = 51,923$  steps [14,512];  $F(3,195) = 7.95, p < .001$ ), with participants in the cash incentive, noncash incentive, and self-reward groups accumulating more steps than the control ( $t(195) = 4.86, p < .001$ ) but not differing from each other (all pairwise  $ps > .1$ ). Individuals in the treatment conditions walked on average nearly 11,000 more steps a week than those in the control, suggesting that contingent incentives indeed “worked.” Notably, those in the self-reward arm—who fully funded their own rewards—performed equally well as those who could earn (externally imposed) \$20 cash bonuses.

The stronger test of my central hypotheses, however, concerns performance when I remove the explicitly articulated incentive structure (*i.e.*, in the post-incentive period). In other words, how do people fare once they are no longer offered weekly rewards or being monitored as part of an experiment? During the pivotal transition from week 3 (incentive period) to week 4 (post-incentive period), those in the cash incentive treatment suffered an immediate and sharp decline, reverting to activity levels ( $M = 42,305$  [20,888]) no different from the control ( $M = 40,587$  [21,077];  $t(153) = .38, p = .70$ ). This was also true of the noncash condition ( $M = 45,172$  [19,689];  $t(153) = 1.03, p = .31$ ), albeit to a slightly lesser extent. However, participants exposed to the self-reward intervention maintained their improvement in step count ( $M = 51,118$  [18,146]) relative to the control ( $t(153) = 2.36, p = .02$ ) and to the three other conditions combined ( $t(153) = 2.28, p = .02$ ), a trend that persisted for several weeks thereafter. Further, a simple effects analysis of period (*i.e.*, from week 3 to week 4) within each condition found while neither the control nor the self-reward group exhibited any significant decline from week 3 to week 4 (control:  $F(1,153) = 2.52, p = .11$ ; self-reward:  $F(1,153) = 1.45, p = .23$ ), both the cash and noncash incentive conditions saw

considerable drops in performance during this interval (cash:  $F(1,153) = 11.90, p = .001$ ; noncash:  $F(1,153) = 4.30, p = .04$ ).

I analyzed the number of steps participants walked as a function of incentive condition, averaging over the two periods (incentive and post-incentive). A 4 (incentive condition)  $\times$  2 (period) mixed analysis of variance, with incentive condition as a between-subjects factor and period as a repeated factor, revealed a main effect of period ( $F(1,153) = 33.78, p < .001$ ) qualified by a condition  $\times$  period interaction ( $F(3,153) = 4.65, p = .004$ ). Decomposing this interaction further, the simple effects of period found that unlike the control and self-reward groups, who did not differ in step count across the periods, those in the cash ( $F(1,153) = 31.37, p < .001$ ) and noncash ( $F(1,153) = 11.53, p = .001$ ) conditions dramatically reduced their activity once the experiment concluded from the participants' perspective.

Note that in both outcome measures examined above (goal attainment and steps walked), participants tended to experience a particularly stark dip in week 5, followed by a gradual climb in performance. I suspect that these movements are most likely due to (i) university-wide midterm exams, which aligned with week 5 (and which I further corroborated with self-reports by participants themselves during their check-in appointments); and (ii) a combination of spring break immediately afterward, compounded by noticeably warmer weather. The overall lift toward the end of the post-incentive observation window may therefore be partially inflated by seasonality. Despite adding measurement noise, however, these exogenous variations should not interact with the incentive conditions to account for the relative differences I observe within these conditions.

*Clustering around the goal.* It is noteworthy that we do not witness a perfect correspondence between goal attainment and walked intensity. The differences in performance between whether people met the step goal and how much they walked speak to an important manner in which cash incentives, unlike noncash alternatives, can “distort” behavior. Figure 5 illustrates this point by

showing the full distribution of steps across all participants in each incentive group. For simplicity, I present the distributions for week 3 (Figure 5) and week 4 (Figure 6) only, as they most clearly depict the contrast in behavior among those in the cash condition as they transition from incentive to post-incentive period (the other weeks exhibit similar patterns; see Appendix A13).

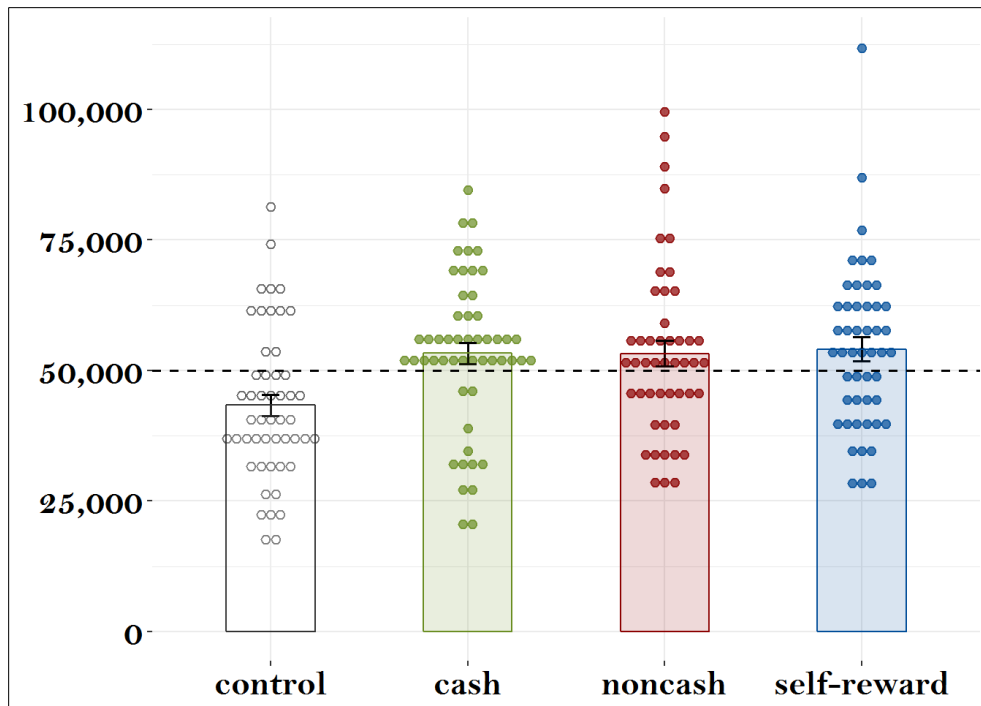


Figure 5: Distribution of steps in week 3 (Study 1). Each dot is an individual. Average number of steps for each incentive condition are overlaid. Error bars are standard errors ( $\pm 1$  SEM). The horizontal dotted line denotes the prescribed goal of 50,000 steps per week.

Taking a closer look at the cash incentive group in Figure 5a, one feature that becomes readily apparent is a “bunching around” the goal of 50,000 steps (*i.e.*, the minimum effort threshold required to earn the reward)—and, by comparison, a sparseness in data immediately below the threshold. In other words, among cash-incentivized participants, a considerably higher proportion just barely reached the goal compared to those who just barely missed it. This discontinuity is notably muted (if not absent altogether) in the control, noncash, and self-reward conditions—there we observe smoother distributions overall, suggesting that these individuals may have been less

concentrated on meeting the goal (and attaining compensation) and more focused on simply walking more. Unsurprisingly, once the experiment ended and external incentives discontinued, the same “bunching” around the goal is no longer present among those in the cash incentive arm (Figure 6).

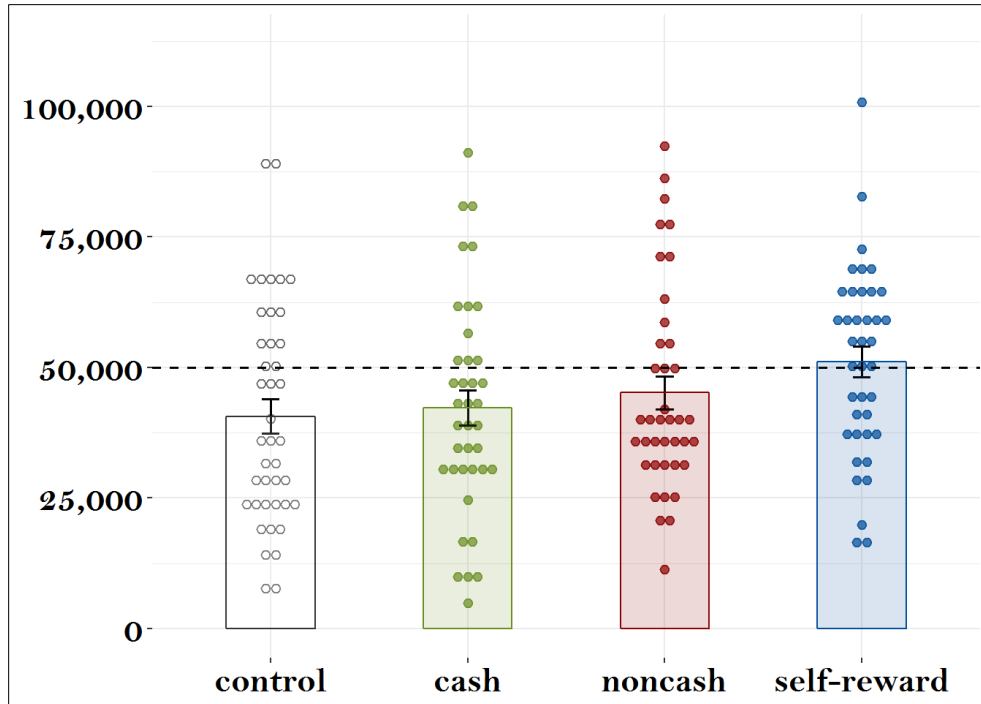


Figure 6: Distribution of steps in week 4 (Study 1). Each dot is an individual. Average number of steps for each incentive condition are overlaid. Error bars are standard errors ( $\pm 1$  SEM). The horizontal dotted line denotes the prescribed goal of 50,000 steps per week.

As an alternative visualization to further capture these differences in “clustering” behavior, I looked at the underlying shapes of each distribution using a series of density plots<sup>20</sup> (Figures 7-8). Examining first the incentive period (week 3, Figure 7), the three treatment arms (cash, noncash, and self-reward) each walked on average more steps compared to those in the control.

<sup>20</sup> These are essentially “smooth” or continuous histograms that illustrate the overall distribution shape (in this case, capturing the frequency of individuals walking at any given number of steps).

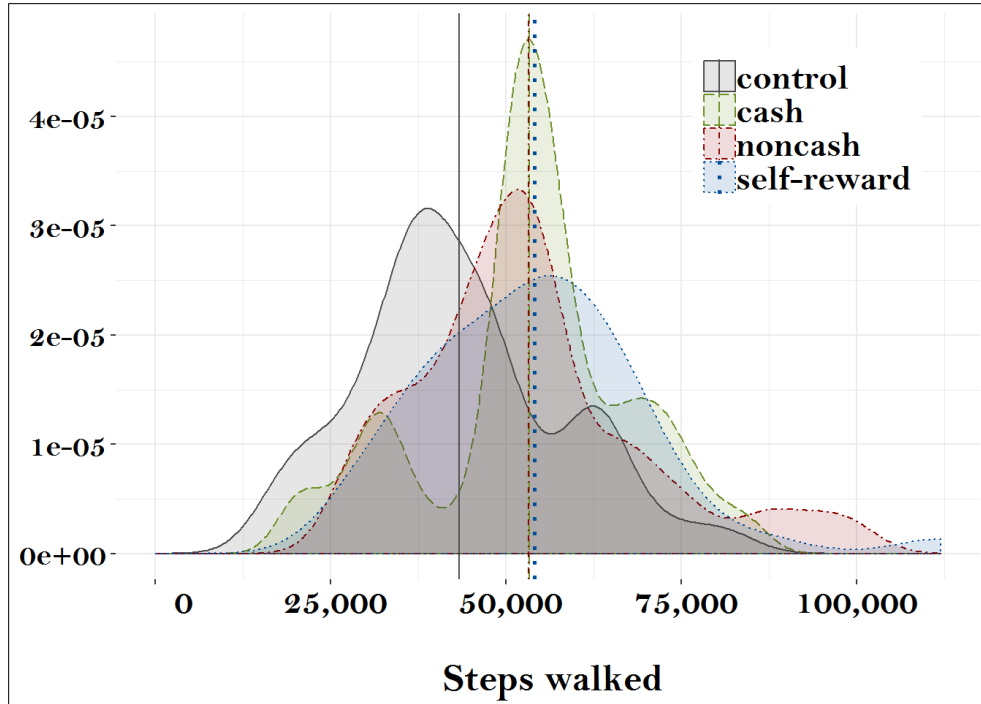


Figure 7: Density of steps walked in week 3 (Study 1). The vertical line of each density curve denotes the average steps walked corresponding to the incentive condition.

Consistent with the patterns shown in Figure 5a, the signature “bunching” among individuals in the cash condition is again visible here in the pronounced peak centered slightly above the 50,000-step threshold (characterized by lower variance around the mean). By contrast, I observed considerably wider peaks, with higher variance, for each of the other three conditions (and especially for the self-reward treatment arm). And, as expected, no such peak appears in the cash condition once the compensation is removed in the post-incentive period (week 5, Figure 8).

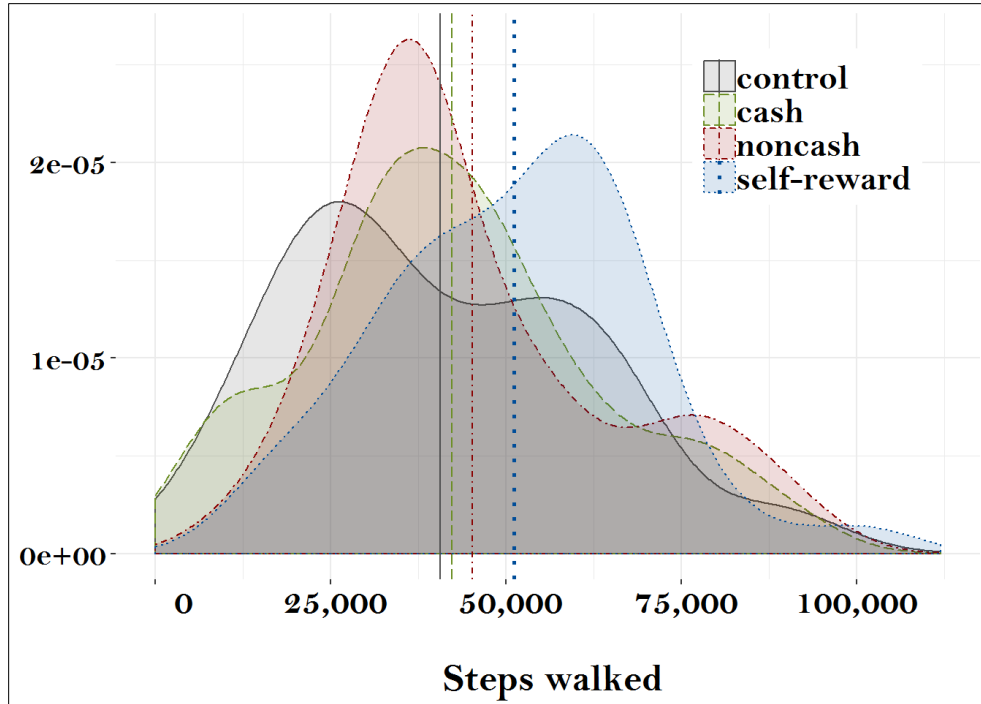


Figure 8: Density of steps walked in week 3 (Study 1). The vertical line of each density curve denotes the average steps walked corresponding to the incentive condition.

*Goal gradient behavior.* The data above suggest that cash-incentivized participants were fairly motivated to reach the goal but substantially less motivated to surpass it. A related question is *when* people tended to meet their goals from week to week. To answer this, I examined participants' step activity at the daily level to see whether any systematic fluctuations prevailed from day to day. Figures 9 and 10 display the daily number of steps walked in each incentive condition aggregated across the incentive and post-incentive periods, respectively.



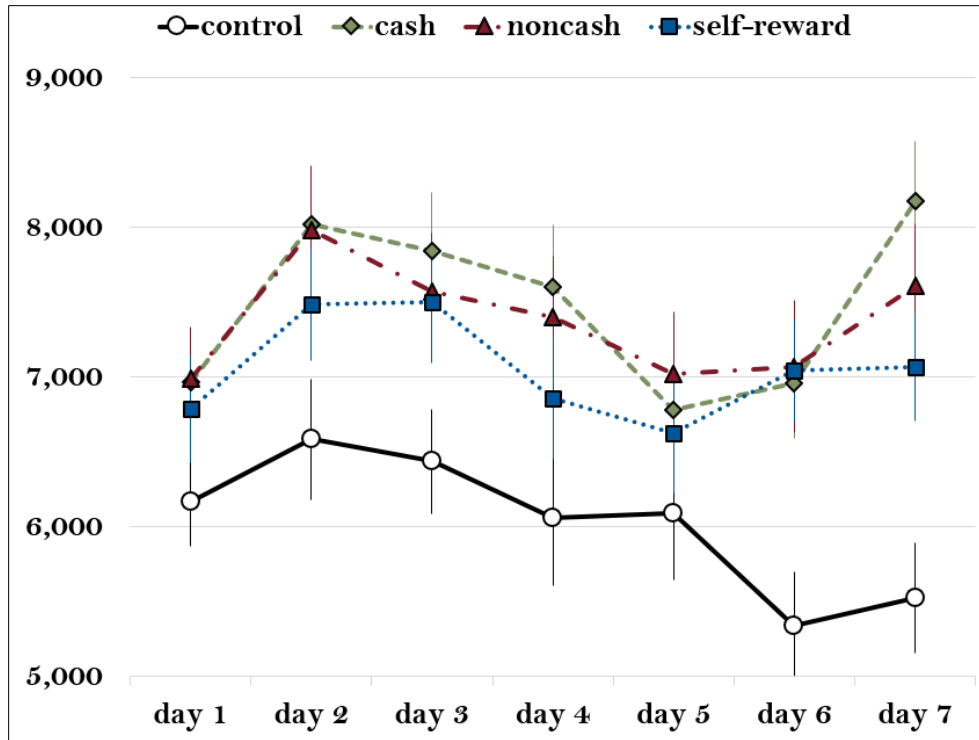


Figure 9: Average steps walked each day during the incentive period (weeks 1-3; Study 1). Error bars are standard errors ( $\pm 1$  SEM).

While there was considerable variation how many steps participants walked over the course of a week, one idiosyncratic feature emerged among those in the cash condition during the incentive period (Figure 9). In particular, only among those who encountered cash incentives did a pronounced increase in steps appear on the last day, immediately prior to their check-in session where they would claim their reward (if they qualified to earn it). The simple effect of day (*i.e.*, day 6 to 7) revealed a significant difference only among those exposed to cash incentives ( $F(1,195) = 6.5, p = .01$ ) and in no other incentive condition. By comparison, once extrinsic rewards are withdrawn in the post-incentive period, the sharp increase in effort vanishes among these individuals (Figure 10).

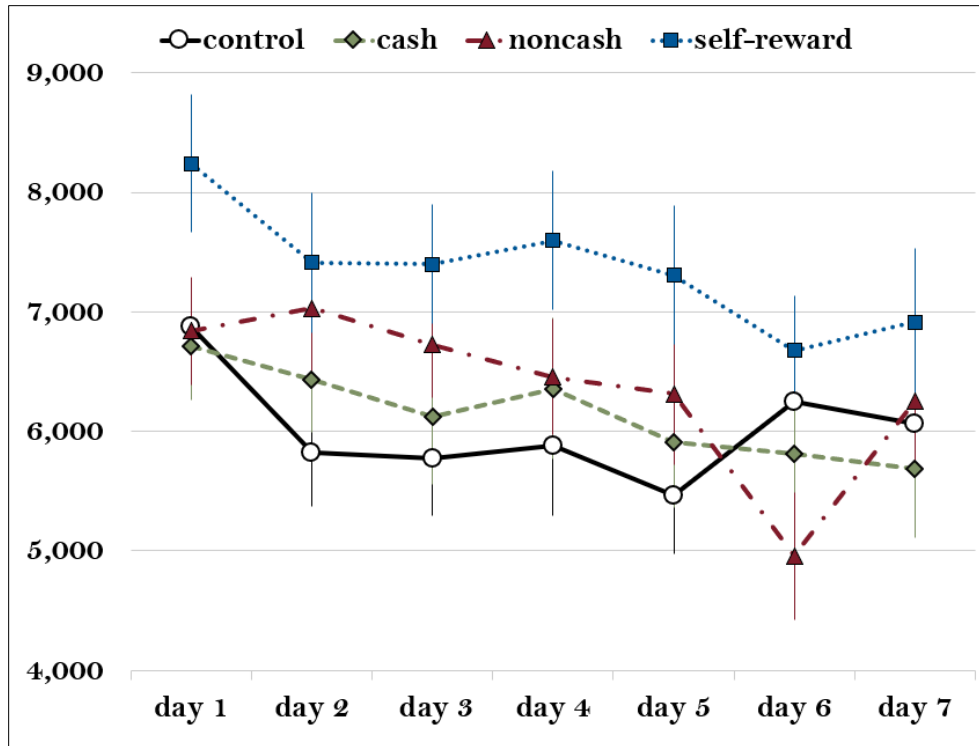


Figure 10: Average steps walked each day during the post-incentive period (weeks 4-8; Study 1). Error bars are standard errors ( $\pm 1$  SEM).

This pattern, I propose, is consistent with the “goal gradient” behavior that previous work has documented (*e.g.*, Kivetz et al. 2006). In this case, participants who faced cash incentives appeared to accelerate their effort as they approached the focal goal or reward—waiting until the last minute before meeting the minimum requirement that secures them payment. Those assigned to the noncash and self-reward conditions, however, did not share this same inclination, instead smoothing out their effort stream from day to day.

*Individual characteristics.* Previous research suggests that financial incentives are primarily effective only for those who were previously lacking in the domain of interest (Charness and Gneezy 2009; Gneezy, Meier, and Rey-Biel 2011; John et al. 2011). For instance, Charness and Gneezy (2009) discovered that paying people to go to the gym helped *ex ante* nonregular attendees but in some cases backfired for regular attendees during the post-incentive period. I expected, therefore, to

see in my data the strongest results for the self-reward among those who indicated at baseline higher levels of physical activity.

However, when I analyzed performance as a function of both incentive type and “resting” fitness, the regression revealed only main effects of incentive condition and perceived physical activity: Participants who scored higher (vs. lower) on the perceived physical activity measure at the beginning of the intervention indeed walked more throughout the program, but this did not interact with incentive condition (see Appendix A14 for details, including supplementary analyses of other individual difference measures such as the type of self-rewards defined as well as gender).

*Lay predictions under joint evaluation.* How well do people’s intuitions map onto their behavior? Recall that in the online exit survey I administered to participants after the post-incentive period, I directly presented a choice among the three reward programs (cash, noncash, and self-reward) and asked for their preferences under joint evaluation (see Appendix A8 for instructions and stimuli).<sup>21</sup> Responses from 165 participants<sup>22</sup> revealed that choice shares of incentive program differed overall ( $\chi^2(6) = 14, p = .03$ ). This effect was driven by an asymmetric preference to join the cash-based program in particular, as Figure 11 depicts. That is, regardless of what program they were randomly assigned to during the incentive phase, participants in each incentive condition chose the program offering contingent cash incentives over hedonic prizes or self-rewards as the one they would personally prefer to enroll in.

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<sup>21</sup> I also posed similar questions for a separate sample of participants who did not participate in the experiment; these results are described in Appendix A15.

<sup>22</sup> Given that the experiment had already formally concluded from the participants’ perspective, I was not able to capture the full sample.

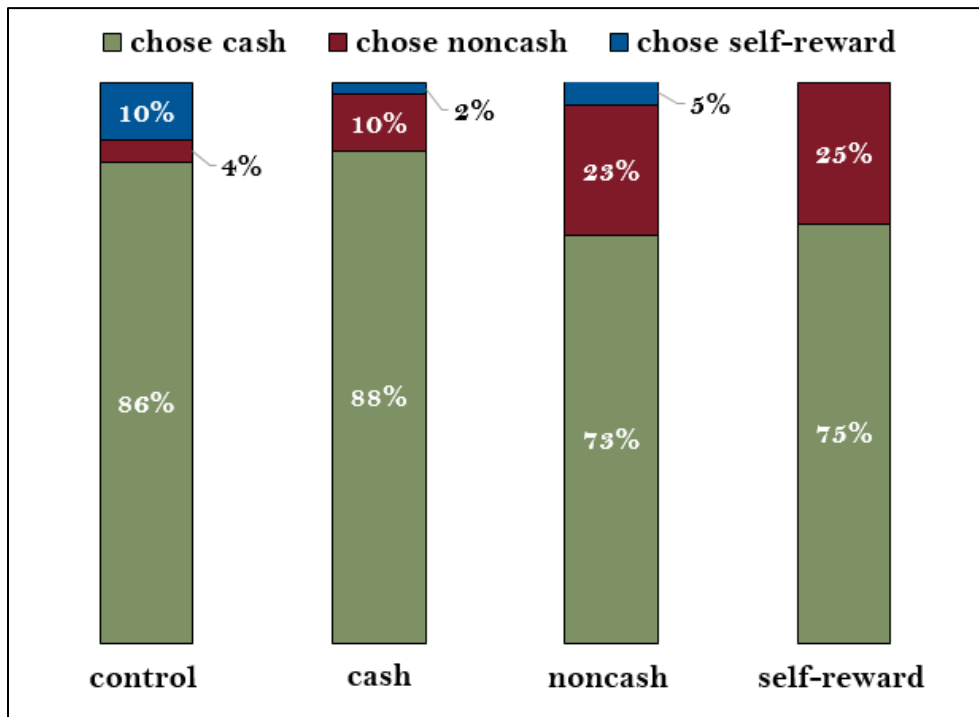


Figure 11: Choice shares of the three reward programs among participants assigned to each incentive condition (Study 1).

I similarly observed a clear ranking from first cash to noncash and lastly to self-reward when asked to judge the relative motivational effectiveness of each program, as well as the percentage of members who would meet the goal in each program. Those assigned to the cash incentive treatment group further expressed that they would be more likely to rejoin the same program they participated compared to those assigned to the self-reward treatment group. Overall, then, people appeared to midpredict how effectively an incentive regimen predicated on self-reward would stimulate positive behavior change, even when they experienced just such objective gains relative to receiving cash incentives.

*Self-reward in-depth interviews.* An interesting metric to observe is whether participants in the self-reward treatment group continue to reward themselves after the experiment ended. To get a better (qualitative) sense of people’s underlying motivations, judgments, and intuitive reasoning, I

conducted follow-up interviews on around half of the participants assigned to the self-reward condition ( $N = 25$ ). During these in-depth sessions (each 30-45 minutes in length), I polled individuals about their retrospective evaluations of the pedometer study as well as the specifics concerning the self-reward program. Only two people in the self-reward condition said they kept running the program on themselves after the experiment was over. Participants seemed on the whole reluctant to attribute any effects (particularly longer-lasting ones) to the intervention or rewards themselves. When I probed them further, almost no one explained their behavior change or improvement in walking activity in terms of or in consequence to the reward structure, but many mentioned that the program helped them enjoy walking for its own sake. The majority claimed that meeting the goal and being able to self-monitor themselves during the study using the tracker tool was “motivating enough.”

#### 2.6.4 Discussion

In Study 1, I conducted a longitudinal field experiment using real incentives and real behavior. During the incentive period, although people who could earn cash incentives tended to meet the goal more compared to those who faced noncash hedonic rewards or self-rewards, the latter two incentive systems proved equally motivating as cash in prompting people to walk more. Given that the cost of these self-rewards was fully born by the participants themselves, I argue that this constitutes a somewhat “impressive” effect in itself. Moreover, during the post-incentive period, self-rewards outperformed cash incentives, yielding greater sustained improvement for multiple weeks. Finally, there arose a clear dichotomy between how people behaved and what they intuit: People overwhelmingly favored cash, despite their objective performance.

From a policy perspective, the dissipation of incentive “fuel” poses a problem, as it becomes economically inefficient, indeed intractable, to rely on monetary rewards in perpetuity. The self-reward incentive structure I have tested in this experiment, which employs an indulgence reward or vice to encourage a virtue, suggests a potential alternative way to foster a healthy habit formation without the counteractive effects of crowding out intrinsic motivation.

## **2.7 Study 2: Incentives to Walk More (Reprise)**

Study 2 aimed to test the robustness of the previous results to a few changes in design parameters. Recall in Study 1 that participants in all incentive conditions walked more overall toward the end of the post-incentive period, particularly following the sharp “dip” in week 5. While I speculated that warming temperatures and midterms accounted for these respective patterns, it is possible that people simply experienced a temporary “post-reward” pause and adjusted their habits upward thereafter—even among those incentivized with cash (*e.g.*, Goswami and Urminsky 2017). If seasonality was indeed the culprit, then we should no longer observe a rising trend during the post-incentive period when the temperature conditions are reversed. Do people continue to persist once external remuneration is withdrawn, even under adverse climates and when facing a higher target step goal?

### **2.7.1 Design**

Study 2 was a second pedometer-based intervention conducted in the fall to winter of 2016-2017. I used the same procedure as Study 1 but made the following design modifications:

(i) Because the experiment began under relatively warmer climates, participants were encouraged (or incentivized) to walk 60,000 steps/week rather than 50,000 steps/week;

(ii) I omitted the noncash treatment arm altogether, as I wanted to concentrate on the relative effectiveness of contingent self-reward, which provides the strongest contrast against offering cash rewards; and

(iii) I decreased the payment and bonus amount for the control and cash conditions, respectively, from \$20 to \$5 in cash.

## 2.7.2 Method

I recruited 185 participants from the Columbia Business School Behavioral Research Lab (average age = 23.2 [ $SD = 6.2$ ], 43% male, average BMI = 23.3 [4.2]). Aside from the changes I mentioned above, participants followed the same procedure as Study 1 (outlined in Section 2.6.2). Specifically, I randomly assigned individuals to one of three groups—a control, cash incentive, and self-reward incentive condition—and asked them to track their steps over the next three weeks using the Moves mobile application (again using an anonymous alias account I generated in advance that was synced online).

Participants in the control read that they would, as part of the program, receive \$5 (in cash) each week regardless of their performance. Those assigned to the cash incentive condition saw that for each week they met the “target goal of 10,000 steps per day for at least 5 days (out of 7) OR 60,000 steps total over 7 days,” they would earn \$5 in cash as a bonus reward at the end of that week. Finally, in the self-reward condition, participants read that if they met the same target step goal, they would earn their choice of a reward they define and will give themselves. All individuals

were subject to the same enforcement policy I imposed in Study 1, based on the donation “threat” to the NRA in the event they failed to redeem their reward.

For the rest of the incentive period (*i.e.* the next three weeks), participants completed activity logs using the data logged by Moves and claimed any compensation they qualified to earn (corresponding to their incentive condition) during their weekly check-ins in addition to the \$3 show-up fee. After the experiment “ended” at the end of the incentive period, the experimenter withdrew all extrinsic payment and relayed the same cover story from Study 1 to discourage any changes made to the app. Lastly, participants completed an exit survey following the 5-week post-incentive period.

### 2.7.3 Results

*Randomization check.* Comparisons of relevant self-reported characteristics (the same included in Study 1, with an added measure of baseline intrinsic interest in walking as a form of activity) indicated that random assignment achieved sufficient balance across the four incentive groups, with no measures differing significantly by condition (all *ps* > .1; see Table 2).

	<b>Control</b>	<b>Cash</b>	<b>Self-Reward</b>	<b>Aggregate</b>
Perceived physical activity (1-4)	2.57 (.10)	2.33 (.09)	2.42 (.10)	2.44 (.06)
Frequency of “working up a sweat” (1-3)	1.98 (.09)	1.90 (.09)	2.06 (.09)	1.98 (.05)
Consistency of exercise routine (1-7)	3.56 (.20)	3.48 (.22)	3.23 (.21)	3.42 (.12)
Desire to exercise more (1-7)	5.64 (.13)	5.73 (.14)	5.77 (.12)	5.71 (.07)
Importance of more exercise (1-7)	5.43 (.16)	5.28 (.16)	5.05 (.18)	5.25 (.10)



Interest in walking in general (1-7)	5.05 (.20)	4.97 (.23)	5.02 (.19)	5.01 (.12)
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Table 2: Baseline summary statistics (Study 2). Standard errors are in parentheses below the means for each incentive condition. The scales used for each measure are indicated in parentheses.

*Attrition.* I lost around 6% of the original sample to follow-up over the course of the incentive period (again, these were participants who failed to show up to a check-in session). As in the first pedometer study, including them in the analyses did not substantially change the results. More people attrited, once again, during the post-incentive period (*i.e.*, those who stopped using the app as instructed); however, attrition rates did not vary by experimental condition in any week during the entire observation window (see Appendix A16 for details on sample size and attrition), although again the interpretation of the results for the last two weeks of the post-incentive period is less clear due to sample size limitations.

*Goal attainment.* Figure 12 shows the proportion of participants who met the step goal of 60,000 steps a week during the intervention and post-incentive periods. Consistent with Study 1 (and indeed to a greater degree), we see higher goal attainment rates among those assigned to the cash condition relative to the control and self-reward conditions.

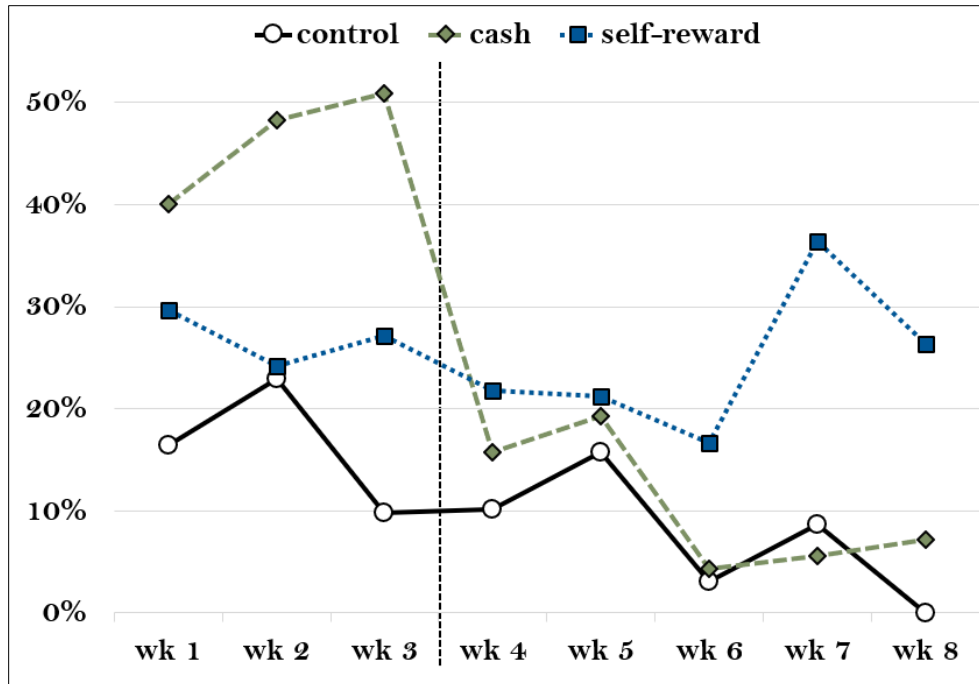


Figure 12: Percentage of participants who met the step goal (60,000+ steps) each week (Study 2). The vertical dotted line denotes the transition window from the incentive to post-incentive period.

In week 1, compared to 16% in the control, 40% and 30% in the monetary and self-reward groups, respectively, walked at least 60,000 steps total ( $\chi^2(2) = 8.32, p = .016$ ); this difference was driven by the overall effect of the two treatment arms (particularly the cash condition) over the control. I observed the same pattern for weeks 2 and 3 of the incentive period (week 2: 23%<sub>control</sub> vs. 48%<sub>cash</sub> vs. 24%<sub>self-reward</sub>;  $\chi^2(2) = 11.37, p = .003$ ; week 3: 10%<sub>control</sub> vs. 51%<sub>cash</sub> vs. 27%<sub>self-reward</sub>;  $\chi^2(2) = 22.84, p < .001$ ). Across the three weeks comprising the incentive period, then, 46% and 27% of participants in the cash and self-reward groups reached the 60,000-step goal, compared to 16% in the control.

Once the post-incentive period began, however, a different picture develops. During week 4, compared to 10% in the control, 16% and 22% among those in the cash and self-reward conditions, respectively, met the goal. Although this difference was not significant across conditions ( $\chi^2(2) = 2.21, p = .33$ ), it is noteworthy that the sudden drop in performance was substantially more dramatic

for participants assigned to the cash condition in particular—no such decline occurred among those in the self-reward group. Further, as the incentive period continued, participants in this latter condition continued to display higher levels of goal attainment overall (25% on average) relative to the control (8%), whereas the same did not hold among those who were incentivized with cash (10%) during the intervention.

*Steps walked.* Figure 13 displays the total number of steps walked each week on average for each incentive condition.

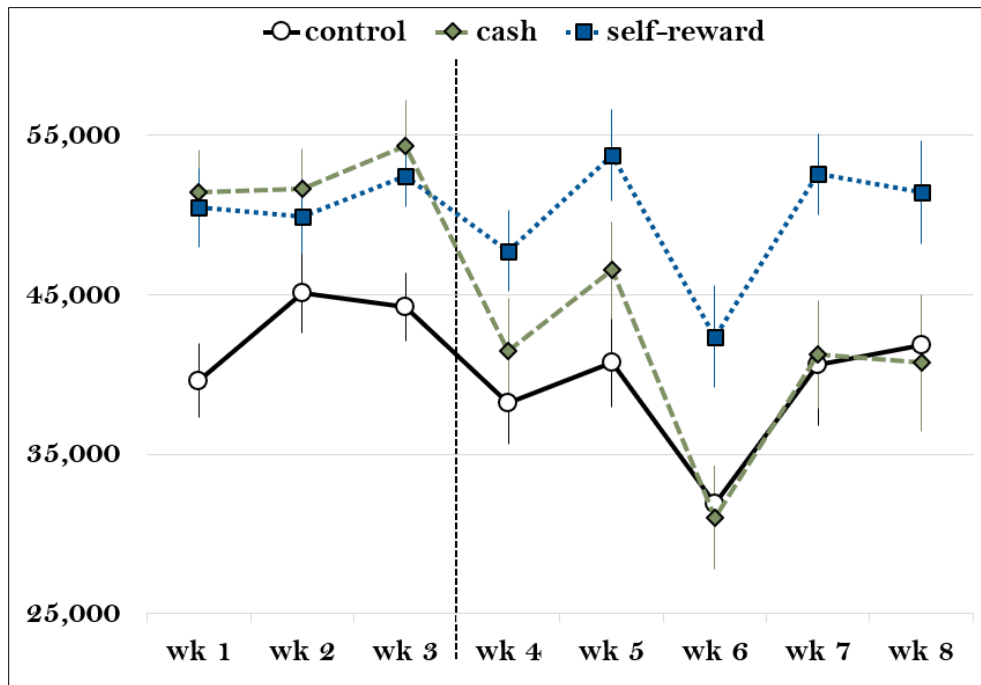


Figure 13: Average total steps walked each week (Study 2). The vertical dotted line denotes the transition window from the incentive to post-incentive period. Error bars are standard errors ( $\pm 1$  SEM).

During the first week of the incentive period, the number of total weekly steps walked differed as a function of incentive condition ( $M_{\text{control}} = 39,340$  steps [ $SD = 18,267$ ];  $M_{\text{cash}} = 51,400$  steps [ $20,730$ ];  $M_{\text{self-reward}} = 50,447$  steps [ $19,848$ ];  $F(2,179) = 7.02, p = .001$ ). Planned contrasts revealed that both incentive treatment arms produced higher step counts relative to the control (cash:  $t(179) = 3.36, p = .001$ ; self-reward:  $t(179) = 3.12, p = .002$ ). Similar patterns emerged in the other weeks of the

incentive period, albeit the effect of incentive condition was muted in week 2 given the higher performance levels among the control (see Appendix A17 for a summary of these results).

Averaging across the incentive period (weeks 1-3), the amount of steps walked varied by condition ( $M_{\text{control}} = 42,984$  steps [16,085];  $M_{\text{cash}} = 53,224$  steps [16,754];  $M_{\text{self-reward}} = 50,583$  steps [15,015];  $F(2,169) = 6.46, p < .001$ ), with participants in the cash incentive and self-reward groups accumulating more steps than the control ( $t(169) = 3.51, p = .001$ ) but not differing from each other ( $t(169) = .87, p = .39$ ). Individuals in the treatment conditions walked on average nearly 10,000 more steps a week than those in the control, suggesting once more that contingent incentives “worked” as expected from economic theory.

How well do people maintain their performance once the intervention is ostensibly over? I again analyzed the pivotal transition from week 3 (incentive period) to week 4 (post-incentive period) and found that those in the cash incentive treatment suffered a substantial decline, reverting to activity levels ( $M = 41,436$  [20,759]) no different from the control ( $M = 38,233$  [18,198];  $t(130) = .79, p = .43$ ). By contrast, participants exposed to the self-reward intervention maintained their improvement in step count ( $M = 47,734$  [17,324]) relative to the control ( $t(153) = 2.36, p = .02$ ) and to the three other conditions combined ( $t(130) = 2.48, p = .01$ ), a trend that persisted for the rest of the post-incentive period. The simple effects analysis of period (*i.e.*, from week 3 to week 4) within each condition revealed that all three experimental conditions suffered some degree of performance decay (control:  $F(1,130) = 10.28, p = .002$ ; cash:  $F(1,130) = 29.71, p < .001$ ; self-reward:  $F(1,130) = 5.34, p = .02$ ). However, the extent or magnitude of this decline during this critical window varied as a function of incentive type ( $F(2,130) = 3.33, p = .039$ ), with the cash condition incurring a steeper drop compared to the control ( $t(130) = -1.97, p = .05$ ) and to the self-reward group ( $t(130) = 2.48, p = .01$ ); the latter did not reveal this same discrepancy relative to control levels ( $t(130) = .57, p = .57$ ).

I analyzed the number of steps participants walked as a function of incentive condition, averaging over the two periods (incentive and post-incentive). A 3 (incentive condition)  $\times$  2 (period) mixed analysis of variance revealed a main effect of period ( $F(1,130) = 108.87, p < .001$ ) qualified by a condition  $\times$  period interaction ( $F(2,130) = 7.94, p = .001$ ). The simple effects of period found that all three conditions indeed experienced some amount of decline<sup>23</sup> (control:  $F(1,130) = 26.77, p < .001$ ); cash:  $F(1,130) = 75.73, p < .001$ ; self-reward:  $F(1,130) = 15.43, p < .001$ ). However, the magnitude of this productivity loss differed according to incentive type ( $F(2,130) = 7.94, p = .001$ ), with the cash condition showing a larger decrease relative to the control ( $t(130) = -3.1, p = .002$ ) and self-reward condition ( $t(130) = 3.80, p < .001$ ), while the latter displayed equivalent levels of decline relative to the control ( $t(130) = .78, p = .44$ ).

Again, the discrepancy that arises between goal attainment and step activity (arguably a measure more indicative of task engagement) suggests a tendency among cash-incentivized participants to “cluster” around a goal (and avoid just missing the mark) when compensation is at stake. In the interest of brevity, I omit the presentation of these data (see Appendix A18 for graphical details on the distribution of steps).<sup>24</sup>

*Lay predictions under joint evaluation.* I recovered 101 participants (33, 34, and 34 in the control, cash, and self-reward conditions, respectively) in my exit survey and analyzed their retrospective evaluations. Of particular interest was their preferences for the cash and self-reward incentive programs when considered jointly. Choice shares of incentive program differed overall ( $\chi^2(2) = 8.94, p = .01$ ), with 79%, 65%, and 94% preferring to join the cash-based incentive program among those

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<sup>23</sup> Perhaps in part due to the increasingly inhospitable weather as winter set in.

<sup>24</sup> Unlike Study 1, I did not detect evidence of “goal gradient” behavior characterized by participants’ tendency to accelerate their effort on the last day in the presence of cash, but not noncash, incentives. (Here, the effort streams from day to day were relatively constant in all incentive conditions.) It is unclear why this pattern did not manifest in Study 2, although particularly strong effects of goal gradient surfaced once more in Study 3.

assigned to the control, cash, and self-reward conditions, respectively. Ironically, those who had personally undergone the self-reward treatment harbored the strongest opinions in favor of cash.

The same held with respect to people's perceived motivational efficacy of the two programs—that is, the extent to which they believe each would increase their own walking activity levels. A 3 (incentive condition)  $\times$  2 (rated program) mixed analysis of variance on perceived effectiveness revealed a main effect of program ( $F(1,98) = 65.43, p < .001$ ), qualified by an interaction ( $F(2,98) = 4.63, p = .01$ ). Regardless of which incentive condition they participated in during the first three weeks of the study, participants ascribed greater motivational efficacy to the program featuring cash incentives compared to self-rewards (control:  $M_{\text{cash program}} = 5.09$  vs.  $M_{\text{self-reward program}} = 4.06; F(1,98) = 11.23, p = .001$ ; cash:  $M_{\text{cash program}} = 4.94$  vs.  $M_{\text{self-reward program}} = 3.88; F(1,98) = 12.22, p = .001$ ; self-reward:  $M_{\text{cash program}} = 5.41$  vs.  $M_{\text{self-reward program}} = 3.24; F(1,98) = 51.62, p = .001$ ). This gap, however, was particularly pronounced among those who rewarded themselves: Not only did they attribute more success to cash, but they also expressed greater doubt on the benefits of self-reward.

Finally, consistent with Study 1, my interviews with participants assigned to the self-reward condition suggest that people had fairly poor insight into their own behavior, with nearly no one attributing their performance improvement to the incentive system.

#### 2.7.4 Discussion

Taken together, Studies 1 and 2 provide convergent evidence that point to contingent self-reward as a viable alternative to cash incentives in improving physical activity.<sup>25</sup> I found consistent results on

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<sup>25</sup> When the externally-prescribed goal or effort threshold is not properly calibrated with the behavior, however, self-rewards—and indeed any rewards, including monetary ones—may not work. Appendix A22 documents two replication attempts in which no incentive effects emerged at all relative to the control, against what is reasonably predicted by economic theory, and offers some rationale for why the tested incentive schemes did not move behavior. Specifically,

both the extensive margin (goal attainment) and intensive margin (amount of steps walked). In short, over the course of the incentive program, participants who faced the prospect of earning cash bonuses were more likely to meet the goal than those who gave themselves rewards of their own definition. On the other hand, the self-reward group performed, on average, equally well as the cash incentive condition in terms of how many steps they walked. When the experiments ended and external rewards were discontinued, those in the self-reward treatment *continued* to do well and indeed outperform their cash-incentivized counterparts.

Note that, as was the case in Study 1, all participants in Study 2 similarly experienced an especially conspicuous drop during one week of the post-incentive period. Week 6 in this case coincided once again with midterm exams, lending more credence to the assertion that such performance decay is more likely attributed to anomalous external factors rather than a general post-reward dip.

As evidenced by consistent lay theories that presume cash as “king,” it seems the case that people systematically mispredict the motivational efficacy of different incentive systems—even if they experienced the effects of self-reward firsthand. These predisposed biases toward cash and against self-reward, while not unexpected, are problematic in that they may pose a psychological barrier to entry in the adoption of such incentive regimes. More efforts should be paid in service of experimenting with alternative marketing strategies to overcome this challenge.

## **2.8 Study 3: Incentives to Go to the Gym**

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when the threshold is set too high, engaging in the behavior may be demotivating across the board. When the threshold is set too low, the goal becomes trivial for everyone to achieve, shrouding any benefits of incentives.

Both Studies 1 and 2 grapple with the question of how to incentivize people, using different reward systems, to perform a virtuous behavior. This objective extends beyond walking, a measure<sup>26</sup> that may be subject to considerable sources of noise (*e.g.*, individual variation in commute or travel schedules). In Study 3, I used a similar paradigm to assess whether the previous results would hold in a different context, in which individuals must deliberately choose to engage in: going to the gym.

### 2.8.1 Design

Launched in the spring of 2017, Study 3 tested whether contingent self-rewards can help people go to the gym more regularly. Following the design of Study 2, I randomly assigned participants to one of three conditions (control, cash incentive, and self-reward). I expected that while incentivizing people with cash (rather than self-rewards) may cause them to reach the goal more than in order to guarantee compensation, self-rewards would lead individuals to do better on a variety of important metrics. In particular, participants exposed to the self-reward treatment would display the most sustained performance and long-term (*i.e.*, as observed in the post-incentive period) improvement in gym attendance frequency and duration. Despite their revealed behaviors, I again expected people to attribute a motivational advantage to cash-based over self-reward contracts.

The incentive period lasted four weeks in total (including the first week of recruitment and enrollment), followed by three weeks of observation without externally-imposed incentives. I imposed a target amount of effort that was fixed across all participants—visiting the gym at least three times per week.<sup>27</sup> The vast majority of participants attended the campus gym, although I did not constrain them from visiting other off-campus gyms.

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<sup>26</sup> An arguably pedestrian one besides.

<sup>27</sup> This performance threshold was based on data collected in the two pedometer studies.



I distributed rewards at the weekly level and instructed individuals to check-in to the lab every week to claim an attendance fee as well as any rewards coinciding to their incentive condition. The enforcement policy was identical to that used in the two pedometer field experiments, with the exception that I did not first elicit evaluations of the list of nonprofit organizations.

The number of (separate) visits to the gym during a given week served as my primary outcome of interest, with an indicator for whether or not participants attended the gym at least once as well as intensity of activity conditional on gym attendance (measured by average time reported spent per gym visit) being key secondary outcomes. While the optimal data would have consisted of verified check-ins at the campus gym as obtained directly from participants' swipe data (as was done in Charness and Gneezy 2009), bureaucratic restrictions hindered my attempts to gain access to such data. Instead, I asked and incentivized participants to provide documentation of their gym attendance by logging their gym activities (along with a photo as proof that they indeed made a visit) using a fitness tracker mobile application called Runkeeper. This app was free to download for iPhone and Android users, allowed for the exporting and access of individual data via an online user interface, and featured a built-in camera tool that made it exceptionally convenient to document attendance with photographic evidence.

## 2.8.2 Method

*Recruitment and enrollment.* Participants consisted of 155 Columbia undergraduate students recruited from the Columbia Business School Behavioral Research Lab during a 5-day (Monday to Friday) window in the spring of 2017 (average age = 22.5 [ $SD = 3.7$ ], 35% male). I advertised the “gym study” as a month-long study about logging gym activity using a fitness tracker mobile application. To qualify, all participants had to own an iPhone or Android smartphone compatible

with Runkeeper, an app I used to observe individuals' self-reported weekly gym activity. Participants were instructed to download the application on their phone in advance.

In the first session, I randomly assigned participants to one of three incentive conditions (control, cash, and self-reward). An intake survey measured baseline fitness habits and individual characteristics (as in Studies 1 and 2), including current levels of gym attendance and activity. Participants read an overview of the study, reiterating that by entering the study they would commit to attend the next three weekly sessions. As with the previous studies, these appointments would serve as 5-minute check-ins, each awarding a \$3 show-up fee (see Appendix A19 for complete instructions and stimuli). People read the following:

To help improve your physical fitness activity by visiting the gym more often, you will be participating in a program for the next few weeks.

This program will use a **fitness tracking application called Runkeeper**, which allows you to easily **track and log your fitness activities every time you visit the gym**. During this study, you will be asked to **log your gym visits and activities using this app**.

Participants were then told to get the attention of the experimenter, who would create and set up an alias account for them to connect their individual Runkeeper data to a randomly generated account that cannot be traced back to their history. These pre-generated alias accounts were randomly assigned to each participant and linked to their Runkeeper app. Because individuals' account data were automatically synced to the Runkeeper server, I could again observe any reported activity remotely.

After setting up their Runkeeper account, all participants were encouraged to visit the gym at least 3 times per week (which I specified as "either Dodge Fitness Center here on campus or any other gym you attend"). They further read that every time they visit the gym, they will be asked to document any activities they completed through the Runkeeper app on their phone, and that if they do not visit the gym during a given week, they should also record that information. Afterwards,

participants saw instructions specific to the condition they were randomly assigned at the beginning of the survey (Appendix A19).

The incentive specifications and procedure were otherwise identical to those imposed in study 2, with participants in the cash and self-reward groups earning the bonus for each week they met or surpassed the goal of three or more weekly visits. Specifically, participants assigned to the control group read that they would, as part of the program, also receive \$5 (in cash) at the end of each week. Those assigned to the cash incentive condition read that if they “meet or exceed the target goal of going to the gym at least 3 times over the course of the week (7 days),” they would earn \$5 in cash as a bonus reward at the end of each week. Finally, those in the self-reward condition read that if they met or exceeded the same target step goal, they would earn their choice of a reward they have defined and will give themselves (*i.e.*, the same instruction wording as in studies 1 and 2, namely an indulgent reward they feel they don’t currently afford for themselves). Participants in this last group then described a reward satisfying the specified criteria.

After learning about the condition-specific incentives, participants proceeded to a page describing the details for how to use the Runkeeper app (although an instruction packet containing the same information would later be provided to them). Specifically, participants read:

Each week, use the app to track every gym visit, *even if you didn’t visit the gym that week*. You’ll receive your weekly check-in payment (\$3) **as long as you provide documentation of your visits or lack of visits.**

For every gym visit they made during a given week, I asked them to report the date, duration, and categories of physical activities they engaged in for that gym session (*e.g.*, running, cycling, strength training, etc.). As proof of attendance, they were to submit a photo that best represents the activity they completed using a built-in camera function in Runkeeper (see Figure 14). On the other hand, if participants did not visit the gym during a week, I instructed them to write a note in the app at the end of the week specifying that they did not attend the gym.

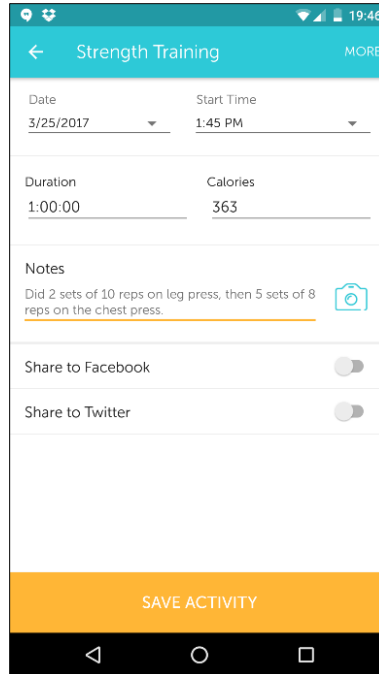


Figure 14: Screenshot of Runkeeper app interface with a sample logged activity (Study 3).

I implemented the same enforcement policy used in the two pedometer studies (*i.e.*, involving the donation threat to the NRA). Finally, participants provided measures of BMI (calculated based on self-reported height and weight), a general self-control trait scale, and basic demographic information. After receiving payment for their participation in the first session, they received from the experimenter a packet to take home containing instructions and reminders corresponding to their assigned condition, as well as detailed instructions on how to document their gym activity using Runkeeper.

*Incentive period.* Over the next three weeks comprising the incentive period, participants documented their activity for each gym visit using the Runkeeper app. Importantly, participants were asked to also log any *lack* of visits during a given week. During each weekly check-in session, participants claimed the rewards corresponding to their assigned incentive condition, collected a \$3 additional cash payment simply for showing up, and received a new packet with reminders to take

home. Participants received weekly emails reminding them to log their activity (or lack thereof) on the app and to “redeem” their rewards by attending each check-in.

*Post-incentive period.* Once the study ostensibly “ended” from the participants’ perspective after three weeks, all extrinsic rewards were discontinued, and participants were told that they will no longer receive any additional rewards, weekly email reminders, or have the “threat” of charity donations as an enforcement policy. However, the experimenter instructed people to continue documenting their weekly gym activity (*i.e.*, whether or not they went each week) and observed data for the foreseeable future until notified, for “data calibration” purposes. To incentivize continual logging using the app, I delivered \$12 via PayPal to all individuals who did so. As was done in the preceding two studies, I continued to remotely access and monitor their gym attendance and activity over the course of the next three weeks.

Finally, following the post-incentive period, I administered one final, 10-minute survey that participants could fill out online remotely in exchange for a \$5 Amazon gift card to be delivered electronically upon completion. The exit survey included the same measures used in the exit surveys of the two pedometer studies.

### 2.8.3 Results

I obtained results that closely parallel those in the pedometer studies. The inferential statistics I report for frequency and intensity (duration) of gym visits are based on log-transformed data, although the untransformed data yield similar patterns.

*Randomization check.* Comparisons of relevant self-reported characteristics (again, the same included in Studies 1 and 2) indicated that random assignment achieved sufficient balance across the three incentive conditions, with no measures differing significantly by condition (all  $ps > .1$ ; Table 3).

	Control	Cash	Self-Reward	Aggregate
Perceived physical activity (1-4)	2.47 (.12)	2.16 (.10)	2.37 (.11)	2.34 (.06)
Frequency of “working up a sweat” (1-3)	1.98 (.10)	1.82 (.09)	1.96 (.11)	1.92 (.06)
Consistency of exercise routine (1-7)	3.59 (.25)	3.02 (.21)	3.33 (.23)	3.32 (.13)
Interest in going to the gym more (1-7)	5.51 (.22)	5.74 (.16)	5.74 (.19)	5.67 (.11)
Desire to exercise more (1-7)	5.98 (.13)	5.98 (.12)	6.04 (.11)	6.00 (.07)
Average number of gym visits per week (0-unbounded) <sup>28</sup>	3.04 (.24)	2.70 (.19)	3.29 (.67)	3.02 (.13)

Table 3: Baseline summary statistics (Study 3). Standard errors are in parentheses below the means for each incentive condition. The scales used for each measure are indicated in parentheses.

*Attrition.* I lost around 5% of the original sample to follow-up over the course of the incentive period (*i.e.*, those who failed to attend a weekly appointment; including these participants in the analyses did not substantially change the results). Unlike the two pedometer studies, far fewer people attrited<sup>29</sup> during the post-incentive period (defined as those whose Runkeeper accounts recorded no activity, indicating that they had stopped using the app). Attrition rates (see Appendix A20) did not vary by experimental condition in any week during the entire observation window.

More people attrited, once again, during the post-incentive period (*i.e.*, those who stopped using the app as instructed); however, attrition rates did not vary by experimental condition in any week during the entire observation window (see Appendix A16 for details on sample size and

<sup>28</sup> Given the considerably lower incidences of gym attendance observed during the intervention, it seems likely that participants were exceedingly optimistic (or else poorly calibrated) in their self-reports of how frequently they go to the gym.

<sup>29</sup> I conjecture this comparatively low attrition rate is largely due to a combination of the additional incentive (\$12) to continue documenting using the app and repeated reminders by the experimenter throughout the intervention.

attrition), although again the interpretation of the results for the last two weeks of the post-incentive period is less clear due to sample size limitations.

*Goal attainment.* Trends consistent with those in the two previous studies emerged when I examined goal attainment, quantified as the proportion of participants who met the goal of at least three weekly visits. Figure 15 illustrates these results across both incentive and post-incentive periods.

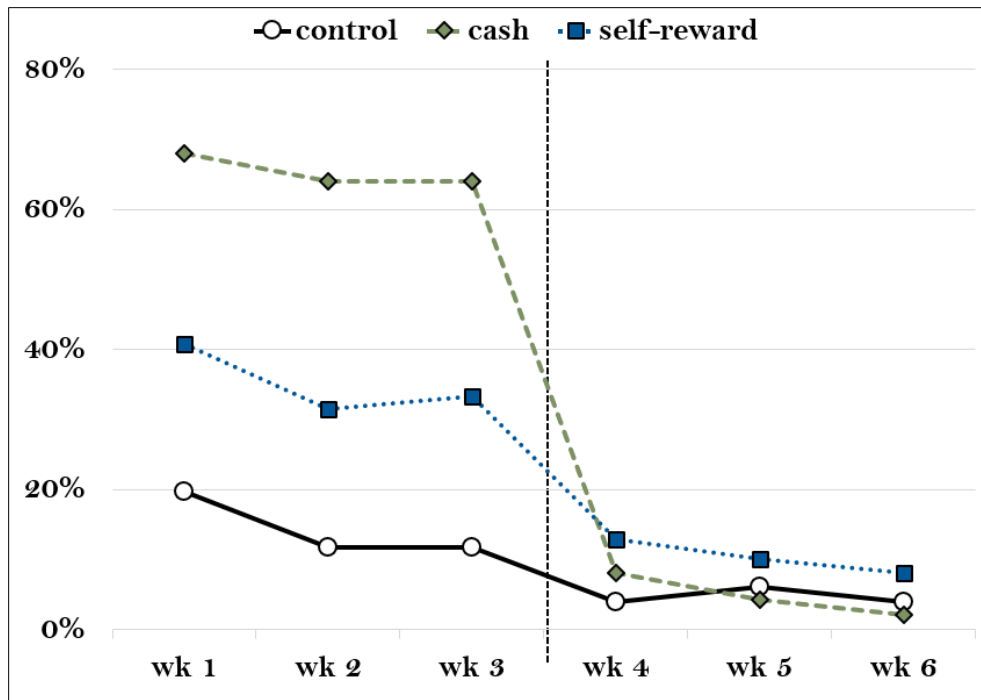


Figure 15: Percentage of participants who met the goal (3+ visits) each week (Study 3). The vertical dotted line denotes the transition window from the incentive to post-incentive period.

In line with the results from Studies 1 and 2, those in the cash condition were once again the most likely to meet the goal. I conducted a series of binary logistic regressions to assess the effect of incentive condition on goal attainment. In week 1, compared to 20% in the control, 68% and 41% in the cash and self-reward groups, respectively, visited the gym at least three times ( $\chi^2(2) = 25.28, p < .001$ ). Relative to the control, a greater proportion of participants in both the cash group ( $B =$

2.17,  $SE = .47$ ,  $\chi^2(1) = 21.67$ ,  $p < .001$ ) and the self-reward condition ( $B = 1.04$ ,  $SE = .45$ ,  $\chi^2(1) = 5.34$ ,  $p = .02$ ) visited the gym at least three times. The same pattern was true for weeks 2 and 3 of the incentive period (week 2: 12%<sub>control</sub> vs. 64%<sub>cash</sub> vs. and 31%<sub>self-reward</sub>;  $\chi^2(2) = 33.03$ ,  $p < .001$ ; week 3: 12%<sub>control</sub> vs. 64%<sub>cash</sub> vs. and 33%<sub>self-reward</sub>;  $\chi^2(2) = 32.71$ ,  $p < .001$ ). Taking the incentive period in aggregate, an average of 65% and 35% of participants in the cash and self-reward groups reached the attendance goal, compared to 14% in the control.

Once more, a different picture surfaces when we consider the post-incentive period. During week 4, compared to 4% in the control, 8% and 13% among those in the cash and self-reward conditions, respectively, met the goal. Although this difference was not significant ( $\chi^2(2) = 3.22$ ,  $p = .20$ ), participants in the cash condition showed a relatively steeper decrease in attendance. The advantage of self-rewards over the control and cash incentives during the post-incentive period, while directionally present, appeared much weaker than observed in the pedometer interventions. I speculate that this muted effect may be due in part to an overall more challenging goal: Most of my participants may find consistently visiting the gym three times in a week to be a fairly difficult task.

I also computed for each individual whether they attended the gym at least once for a given week; this measure, also used in previous research (*e.g.*, Charness and Gneezy 2009), is intended to capture the willingness to exert some minimum level of effort. Figure 16 displays the proportion who made at least one weekly trip to the gym over the course of the intervention.



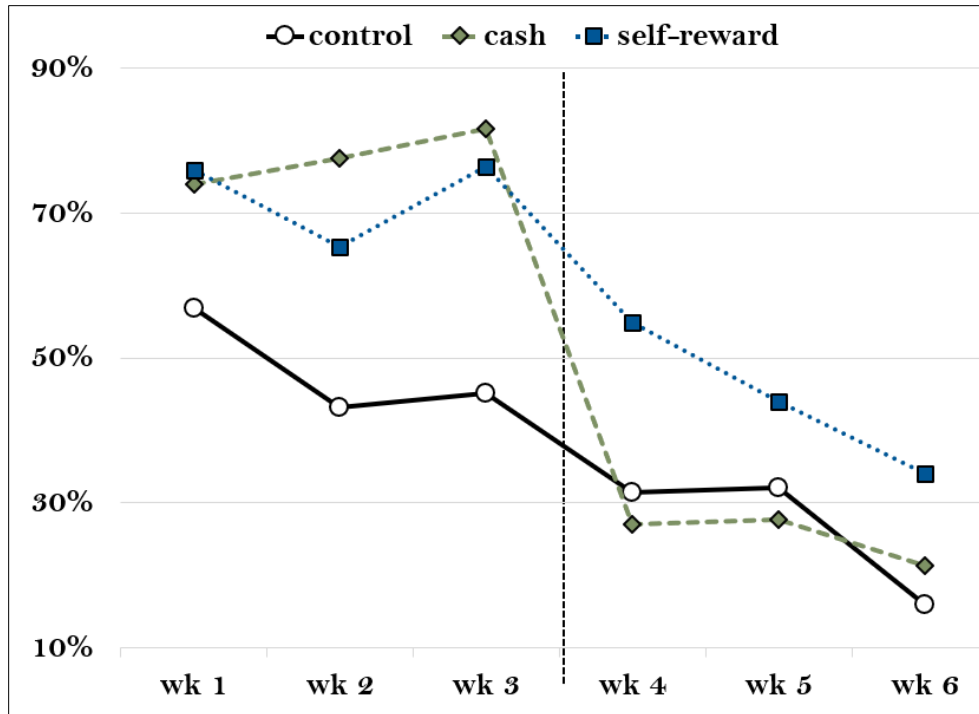


Figure 16: Percentage of participants who made at least 1 visit (Study 3). The vertical dotted line denotes the transition window from the incentive to post-incentive period.

On this measure, participants in the self-reward condition performed equally well during the incentive period compared to their counterparts in the control and cash incentive groups (weeks 1-3) and markedly better once the experiment formally ended (weeks 4-6).

*Gym attendance frequency.* Figure 17 shows the number of times participants visited the gym on average for each of the three conditions. During the first week of the incentive period, the number of visits made to the gym varied across incentive conditions ( $M_{\text{control}} = 1.18$  [1.23];  $M_{\text{cash}} = 2.18$  [1.40];  $M_{\text{self-reward}} = 1.91$  [1.50];  $F(2,152) = 7.19, p = .001$ ). Planned contrasts revealed that compared to the control group, each of the incentive treatment arms led to more visits (cash:  $t(152) = 3.66, p < .001$ ; self-reward:  $t(152) = 2.71, p = .007$ ). Combined, both treatment conditions generated more frequent gym visits than the control ( $t(152) = 3.68, p < .001$ ) and did not differ from each other ( $t(152) = 1.01, p = .32$ ). Similar patterns emerged in the next two weeks of the incentive period (see Appendix A21 for a summary of these results).

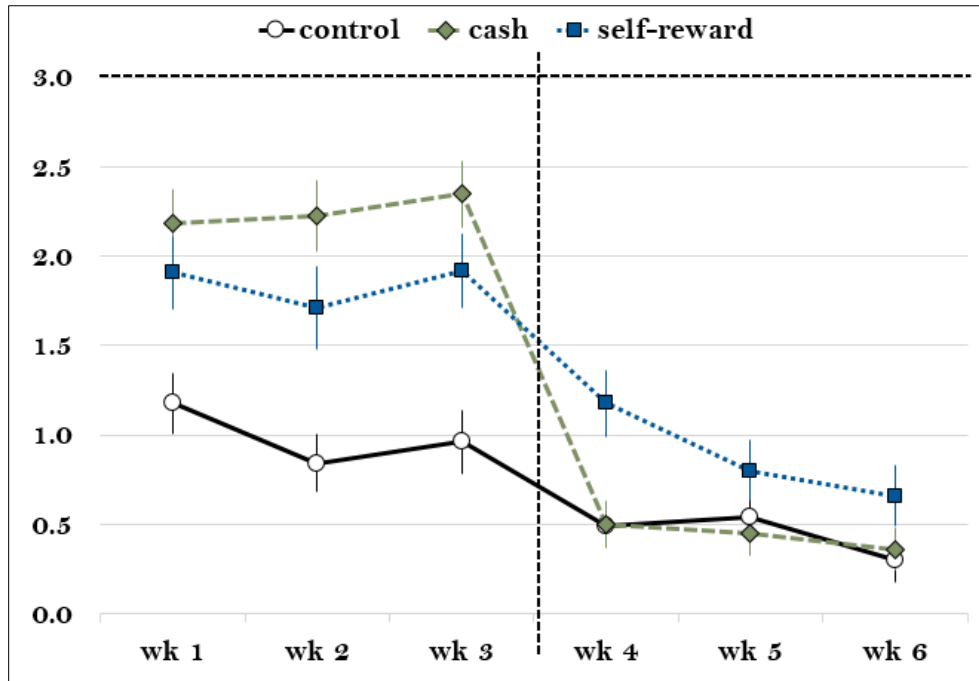


Figure 17: Average total gym visits each week (Study 3). The vertical dotted line denotes the transition window from the incentive to post-incentive period. The horizontal dotted line denotes the prescribed goal of 3 visits per week. Error bars are standard errors ( $\pm 1$  SEM).

Averaged across the incentive period (weeks 1-3), gym attendance rates differed by condition ( $M_{\text{control}} = .99$  [.91];  $M_{\text{cash}} = 2.27$  [1.22];  $M_{\text{self-reward}} = 1.85$  [1.40];  $F(2,148) = 14.98$ ,  $p < .001$ ), with both the cash and self-reward groups frequenting the gym more often than the control ( $t(148) = 5.21$ ,  $p < .001$ ) but not differing substantially from each other ( $t(148) = -1.75$ ,  $p = .08$ ).

The post-incentive (weeks 4-6) data again reveal a steeper (and immediate) performance decline among those in the cash condition. On average, those assigned to the self-reward treatment logged almost twice as many gym visits ( $M = .87$  [1.08]) compared to the control ( $M = .44$  [.70];  $t(147) = 2.54$ ,  $p = .01$ ) and cash ( $M = .43$  [.73];  $t(147) = 2.54$ ,  $p = .01$ ) groups, which did not differ from each other ( $t(147) = -.043$ ,  $p = .97$ ).

*Goal gradient behavior.* The dynamics of gym attendance among cash-incentivized participants revealed evidence suggestive of the same goal gradient behavior documented in Study 1. Figures 18

and 19 display the number of visits made on average on a daily basis during the incentive and post-incentive periods, respectively.

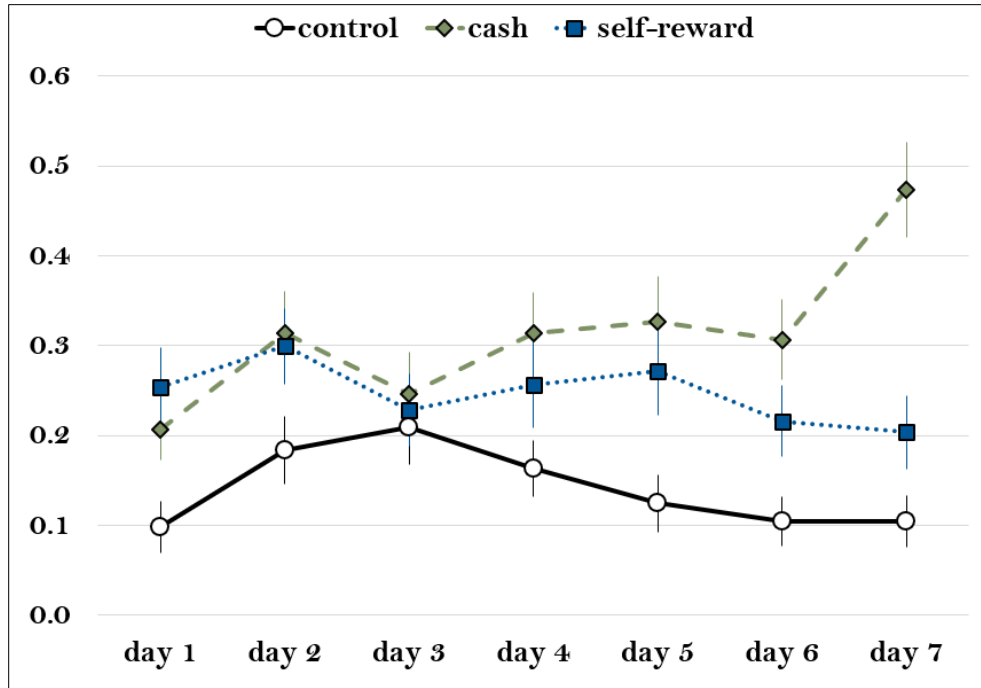


Figure 18: Average gym visits each day during the incentive period (weeks 1-3; Study 3). Error bars are standard errors ( $\pm 1$  SEM).

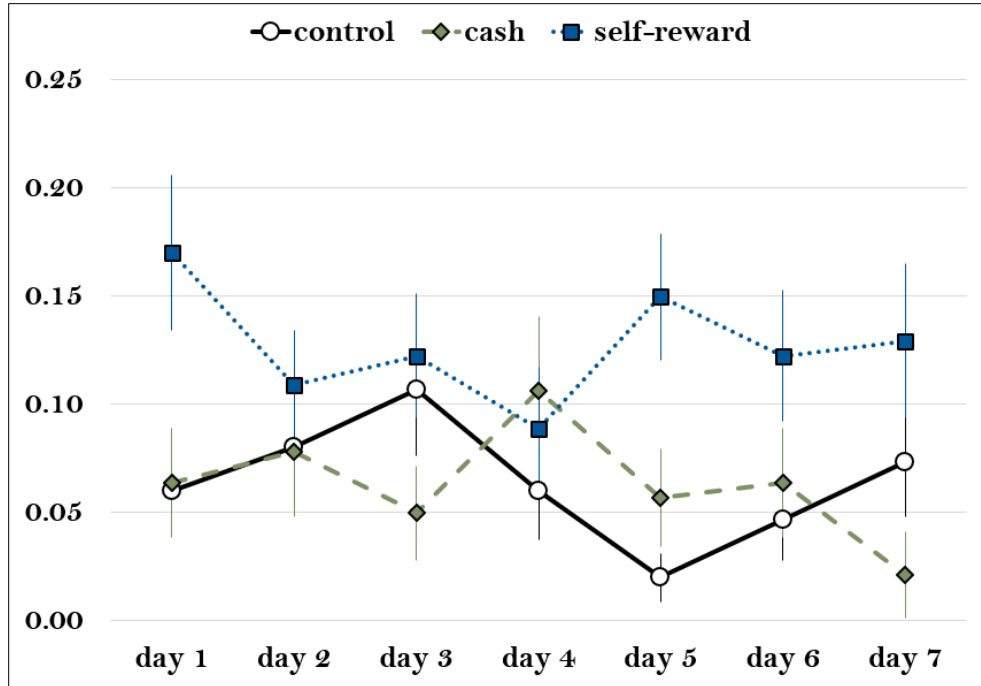


Figure 19: Average gym visits each day during the post-incentive period (weeks 4-6; Study 3). Error bars are standard errors ( $\pm 1$  SEM).

A  $3$  (incentive)  $\times 2$  (period) mixed analysis of variance on the incremental number of visits on the *last day* (i.e., day 6 to 7) revealed an interaction ( $F(2,143) = 6.10, p = .003$ ): Whereas attendance did not vary across periods for those in the control ( $M_{\text{incentive}} = .00$  vs.  $M_{\text{post}} = .03$ ;  $F(1,143) = .22, p = .64$ ) and self-reward ( $M_{\text{incentive}} = -.03$  vs.  $M_{\text{post}} = .01$ ;  $F(1,143) = .35, p = .56$ ) conditions, cash-incentivized participants logged more visits on the very last day during the incentive period but not afterwards ( $M_{\text{incentive}} = .17$  vs.  $M_{\text{post}} = -.04$ ;  $F(1,143) = 13.88, p < .001$ ).

*Gym activity intensity.* Conditional on going to the gym, did participants who rewarded themselves spend more time per visit? I computed this metric for each individual based on self-reported duration data aggregated across all activities logged using the Runkeeper application; these results are aggregated in Figure 20.

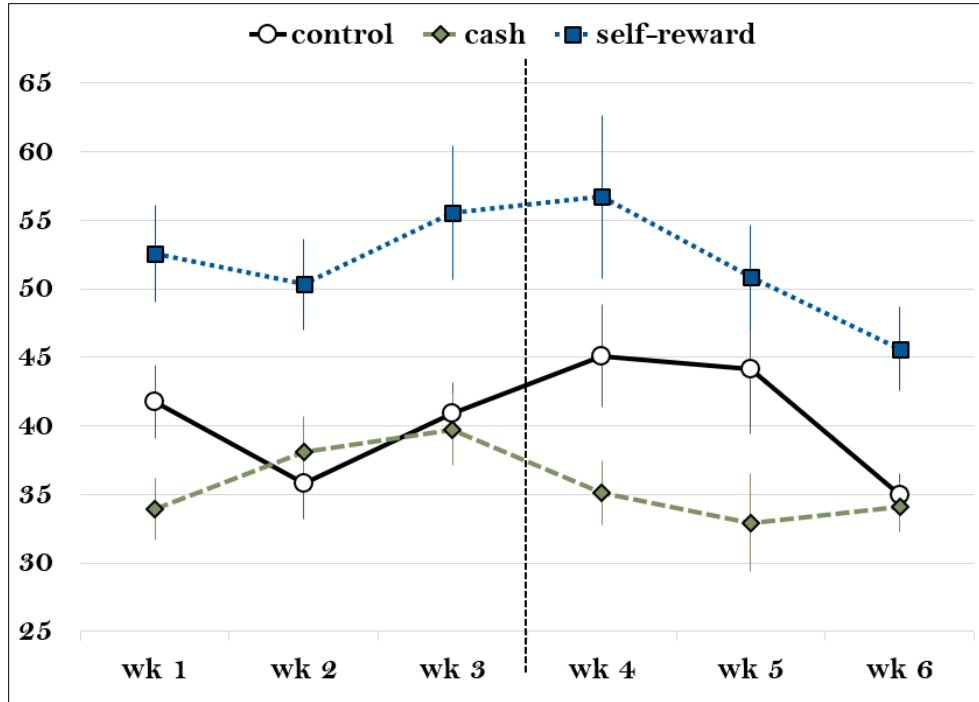


Figure 20: Average time (minutes) spent per gym visit each week (Study 3). The vertical dotted line denotes the transition window from the incentive to post-incentive period. Error bars are standard errors ( $\pm 1$  SEM).

Compared to the control ( $M = 39.80$  [15.48]) and cash ( $M = 37.69$  [15.57]) conditions, participants in the self-reward treatment spent on average more minutes per visit ( $M = 51.60$  [25.72];  $t(117) = 3.08$ ,  $p = .003$ ) during the incentive period. Not surprisingly, this lift in performance tended to be fairly smooth over the course of the entire observation window. When the intervention concluded, those in the self-reward condition ( $M = 50.87$  [25.85]) maintained their greater intensity of gym activity relative to the control ( $M = 42.36$  [25.91]) and cash groups ( $M = 33.44$  [15.88];  $t(73) = 2.37$ ,  $p = .02$ ).

#### 2.8.4 Discussion

Study 3 tested the effectiveness of a self-reward incentive contract, relative to a (non-contingent) control and a contingent cash incentive system, in a second domain—that of gym attendance and

activity. I discovered similar patterns to the previous two field experiments that incentivized people to walk more. Although participants who could earn cash were the most likely to meet the goal, they did not appear especially motivated to exceed that benchmark (indeed, because their reward depended on simply going to the gym three times and no more). Further, cash-incentivized individuals were more likely to exhibit goal gradient behavior, suddenly accelerating their effort right before they are due to receive compensation.

Those who rewarded themselves (bearing the full cost of their self-defined rewards), by contrast, not only rivaled their cash-incentivized counterparts in goal attainment but surpassed them in the longer-term, continuing to visit the gym after the intervention officially ended (and doing so, moreover, in a smoother fashion over time). Finally, these same participants scored particularly high on an additional measure of task engagement supplied in this study: They reported spending more time per visit exercising. In short, the consistency with which I observed these trends across all three applications suggest that, at least in the contexts I surveyed, an incentive program centered on self-reward can serve as a compelling (as well as efficient) self-control strategy.

## **2.9 General Discussion**

### **2.9.1 Summary and Implications**

In this chapter, I compared the efficacy of different incentive schemes in motivating short- and longer-term behavior under realistic (albeit relatively noisy) environments. Studies 1 and 2 examined people's daily walking activity, while Study 3 looked at gym-going behavior. Across these three experiments, several recurring motifs may be discerned:

(i) *Goal attainment.* Over the course of the reward program (*i.e.*, while incentives were in play), people who could earn cash were most likely to meet the pre-specified goals dictated by the program. This is consistent with the idea that participants viewed cash as a currency of “compensation,” one that was contingent on meeting a quota but not surpassing a minimum effort threshold.

(ii) *Engagement in focal activity.* However, on metrics arguably more indicative of meaningful task engagement, such as how *many* steps people walked and how *often* they attended the gym, self-rewards were equally effective as cash during the incentive period and more effective afterwards. (And, in the case of going to the gym, participants who rewarded themselves spent more time exercising per visit compared to those rewarded with cash both during and after the intervention.) As most prominently shown in Study 1, the inclination of cash-incentivized participants to exhibit certain discontinuities around the goal (so as to avoid narrowly missing it) is further suggestive of a single-minded focus on reaching a minimum prescribed effort criterion to secure payment—but to stretch no farther.

(iii) *Persistence and habit formation.* Perhaps most importantly, what happens once external incentives are removed? In all three cases, those who faced cash incentives promptly dropped to control levels of performance. By contrast, self-rewards led participants to persist more, generating comparatively more sustain over multiple weeks.

(iv) *Disconnect between behaviors and intuitions.* The motivational advantages participants assigned to cash incentives when directly weighed against self-rewards appeared distinctly at odds with their revealed behaviors. Despite an objectively superior performance, the same individuals who completed the self-reward contract believed that they would not only have preferred but also done significantly better under an incentive program that offered cash.

These data contribute to a growing literature on the role of incentives in shaping habit formation and self-control without the accompanying “crowding out” effect sometimes observed in the presence of monetary rewards. Practically, the present research has implications for the design of incentive schemes that target longer-term behavioral change. By specifically defining and treating themselves to rewards that they would otherwise not tend to afford for themselves, such a system may in effect allow people to “earn the right to indulge” (Kivetz and Simonson 2002a) and thereby satisfy both “extremes” of self-control.<sup>30</sup> Moreover, by their very nature, self-rewards are scalable, impose zero cost for the program sponsor, and can be implemented according to the individual or circumstance: Anyone can design their own commitment contract.

### 2.9.2 Limitations and Extensions

The empirical evidence documented in this chapter leaves considerable room for integrating more psychological insights into the design of personally motivating incentive structures. I outline only a few possibilities below.

The data collected remain relatively agnostic to the question of *why* self-rewards seem to confer an advantage with respect to engagement and longer-term persistence.<sup>31</sup> Did participants in the self-reward treatment perform well because of the intrinsic, self-imposed nature of the incentive contract, or perhaps because they defined a personally relevant reward that complemented the effort criterion? To get a better sense of the causal mechanism(s) behind the success of self-rewards and to systematically measure their relative influence, I intend to calibrate the current design so as to isolate

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<sup>30</sup> That is, the coexistent myopic and hyperopic “selves.” This effect may be akin to the “mere token effect” documented by Urminsky and Kivetz (2011), where tethering an immediate gratification of a short-term desire encouraged people to exercise greater self-control than they otherwise would.

<sup>31</sup> Nor did the participants themselves have clear insight as to the reason, with the majority predicting cash-based incentive programs to outperform ones using self-rewards.



the ways in which the cash, noncash, and self-reward conditions differ (*e.g.*, fungibility, personal relevance, self-determination, among other dimensions). One possibility is to test a broader range of noncash incentives beyond hedonic rewards, including necessities, credit cards, promotions, rebates, and hybrid (*e.g.*, point-based) systems that combine monetary and nonmonetary features. Another useful comparison to the self-reward group would be a separate condition that allows participants to define tangible rewards worth a given amount (say, \$20) which would then be externally administered by the experimenter.

As well, several aspects of the study design used in the three studies would benefit from further experimentation. To more rigorously replicate and iterate on the results from the field experiments, follow-up studies should include a pre-incentive period, during which all participants are asked to self-monitor their activities sans any incentives. More generally, it would be instructive to identify a handful of factors governing when self-rewards are likely to outperform cash incentives. For example, I would expect their relative success to diminish in contexts that are less conducive to habit formation—as in the case of single-shot tasks compared to repeated-choice settings, or when facing lump-sum compared to piecemeal rewards.

Note that participants assigned to the cash incentive group across all three interventions faced a compensation schedule based on a discrete rather than continuous measure of performance—that is, people were paid only if they met a minimum prescribed goal and earned nothing otherwise. In reality, there exists a wider assortment of incentive structures and tiers that could potentially help these individuals attain more incremental stretch goals.<sup>32</sup> Future work should

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<sup>32</sup> Nevertheless, whenever “true” engagement and effort are not directly observable or measurable, I would predict self-rewards to maintain their motivational advantage over cash incentives. We might imagine, for example, that paying people to stay at the gym, rather than to visit the gym, may indeed result in more minutes accrued per visit. However, without rigorous enforcement or documentation, these same participants may have opted for easier, if not trivial, activities during their stay (*e.g.*, a trip to the sauna over a cardio session). I test this predicted predilection for less challenging tasks more directly in Chapter 3.

also explore the implications of relaxing the fixed goal requirement by either varying effort levels or allowing individuals to set their own performance standards.

Finally, although walking and gym attendance constitute different behavioral outcomes, they both relate to physical fitness and, to a broader degree, health. How would the findings described in this chapter generalize to other domains, such as academic performance or financial decision making? A related issue concerns the characteristics of the sample pool. Because the recruiting material in all three field experiments mentioned exercise, the samples I ultimately obtained were likely more homogeneous and less representative of the general population than would be ideal. Furthermore, given that my participants were predominantly young college students motivated to stay active (the majority of whom rated themselves to be at least moderately active), no doubt there is some degree of self-selection. Would these findings, therefore, hold for other populations (*e.g.*, large salesforces, children, etc.), or for populations for whom the effort domain is more personally relevant (*e.g.*, diet programs among those who struggle with obesity)? Reflecting on the broader notion of compensation focus and crowding out effects: What are the developmental origins of intrinsic motivation, and to what extent might receiving different rewards in the formative stages of development shape our future sensitivity to different incentive regimens?<sup>33</sup> More data is needed to explore these and other questions.

### 2.9.3 Conclusion

The studies chronicled in this chapter underscore a need for continued research into more intrinsically motivating incentive systems—ones that encourage habit formation, that are less reliant

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<sup>33</sup> A longitudinal study on the behavior and decisions of young children would be instructive in this regard. For example, an interesting question here is whether there exist discernible long-run effects of giving people monetary compared to nonmonetary allowances while growing up.

on external reinforcement, and that focus individuals on engaging in the focal activity as opposed to meeting a minimum goal. As a first step toward this overarching goal, I have documented three instances where people seem to have successfully created their own commitment contracts to engage in a “virtuous” behavior using as rewards the very “vices” they would otherwise feel guilty about consuming in isolation. Designing and enacting initiatives that, at minimal cost to the sponsoring agent, enable individuals to help themselves presents an opportunity for marketers and policymakers who wish to improve the behaviors of their constituents. Future research will more closely inspect the mechanism(s) behind the success of self-rewards and clarify the bounds of their motivational effectiveness.

## CHAPTER 3

### CASH (DIS)INCENTIVES

#### 3.1 Some Peculiarities of Cash Incentives

Chapter 2 documented three cases in which incentive mechanisms that used self-rewards—indulgent awards defined and imposed by the individual—outperformed cash-based programs with respect to task engagement and longer-term habit formation. While these data are a testament to the motivational potential of self-rewards, they also point toward a few idiosyncrasies with cash in particular—idiosyncrasies that render it a *disincentive* in its own right. Recall that across both the pedometer and gym applications, individuals assigned to the cash group (compared to the self-reward and noncash treatment arms) exhibited a propensity to cluster or “peak” just slightly above the prescribed performance threshold (and drop sharply thereafter). The same individuals also displayed considerably less “smoothness” in their day-to-day effort streams, with participants tending to accelerate their effort as they approach the reward toward the end of each week (*i.e.*, a goal gradient effect).

In this chapter, I contend that these behaviors are part and parcel of a broader umbrella of interrelated effects in goal pursuit, all of which can be categorized as manifestations of *compensation focus*. Not only can a heightened emphasis on securing compensation lead to the distortions in behavior observed among cash-incentivized participants in the field experiments, but—as I later propose—it can also give rise to undesirable consequences when it comes to choosing incentive structures, setting goals, and performing tasks with integrity. To analyze this more closely, I conducted a series of studies under more controlled environments in which (*i*) rather than observe

repeated behaviors over a period of time, I examined decisions under single-shot contexts; and (ii) rather than look at novel types of incentive schemes such as self-reward, I focused on a tighter comparison—namely, between cash incentives and noncash tangible rewards of equivalent retail value. Note that the field experiments reported in Chapter 2 did not allow participants the opportunity to choose between different incentive programs or to set their own goals and effort thresholds. Nor did the design present easy opportunities for people to cheat on the focal activity. In Chapter 3, I proceed to relax these constraints to study precisely the effects of incentive structure on what kinds of rewards people prefer, what goals and effort streams they opt for, and how much they are willing to cheat or act dishonestly to acquire their payment.

The current investigation contributes to a recent and growing body of work on the psychological effects of money and monetary rewards, which has uncovered a set of (arguably) adverse consequences on choice and behavior. One line of inquiry has advanced some psychological consequences of exposure to money and monetary prospects. For example, activating the concept of money may potentially shift behavior and the nature of social interactions and relationships (Fiske 1991), rendering people more self-sufficient, less altruistic, and more likely to endorse free-market values (Caruso et al. 2013; Vohs, 2015; but *cf.* some work questioning the reliability of money-priming effects, *e.g.*, Klein et al. 2014; Rohrer, Pashler, and Harris 2015). Other research on the affective psychology of risk contrasts valuations of monetary with nonmonetary outcomes (*e.g.*, a gamble consisting of losing \$50 vs. incurring an electric shock) and suggest that the former, being less “affect-rich,” makes people more sensitive to changes in probability within the extremes of certainty and impossibility (McGraw, Shafir, and Todorov 2010; Pachur, Hertwig, and Wolkewitz 2014; Rottenstreich and Hsee 2000) and to variations in scope (Hsee and Rottenstreich 2004).

Rather than prime concepts of money or look at people’s joint evaluations of monetary and nonmonetary prospects, in the present research I contrast cash incentives to similarly extrinsic,

tangible noncash rewards (and unrewarded controls) to explore a variety of interrelated (but hitherto unintegrated) motivational effects under settings where individuals must, or are expected to, expend effort. These comparisons span hypothetical scenarios, incentive-compatible choices, as well as real-effort tasks with consequential incentives.

The rest of this chapter is organized as follows: First, I proceed to develop predictions for how cash incentives (compared to noncash rewards and no-incentive controls) can shift preferences and behavior toward riskless, immediate, and easier alternatives—specifically as they relate to the domains of choice, goal setting, and integrity. I then present seven sets of studies that provide some evidence on the varied demotivating effects of contingent cash incentives. The empirical findings indicate that, consistent with inducing a compensation focus, offering cash in return for investing effort moved priorities toward receiving payoff and away from engaging in the activity: People become focused on ensuring, and avoiding any delay in, their reward. Moreover, cash incentives drove individuals to cheat more on real-effort tasks in order to gain compensation. I conclude by discussing the compensation-driven psychology underlying monetary incentives and its implications for motivation, self-control, and welfare.

### **3.2 Compensation Focus: Consequences for Choice, Goal Setting, and Integrity**

As relayed in Chapter 2, the fact that cash as a currency is so far removed from any behavior or effort domain makes it perhaps the most extrinsic kind of reward imaginable. The universality of cash, together with its almost inherent association with transaction and labor exchange in the marketplace (*e.g.*, Fiske 1991), makes any monetary incentive system likely to increase people's focus on securing compensation for their effort. I further advance that this conceptualization of cash increasing focus on compensation (relative to equally extrinsic noncash rewards) leads to a general

attraction to options that promise smaller but guaranteed, immediate, and easy-to-obtain rewards—a pattern that holds important consequences for goal pursuit.

Although compensation focus may instantiate itself in multiple ways, in this chapter I highlight three general domains relevant to motivation: *(i)* choices involving probabilistic and delayed rewards, in which a tradeoff exists between a reward's magnitude and its certainty or temporal delay; *(ii)* choices involving goals or activities of varying effort levels, in which a tradeoff exists between a task's difficulty and the likelihood of receiving a higher payoff; and *(iii)* cheating behaviors. The first and second areas speak to the effect of cash (vs. noncash but similarly extrinsic) incentives on preferences for incentive structures that promise certainty, immediacy, and ease; the second area looks at how incentivizing people with cash to complete real-effort tasks can skew actions toward cutting corners by cheating more.

A central hypothesis here is that people who are asked to expend effort in exchange for cash may expect and desire a short and certain path by which to obtain the prize. Rather than opt for larger effort-contingent rewards that are either probabilistic or require waiting longer, they are likely to become more attracted to smaller and easier cash amounts that promise certainty and immediacy. Further, when receipt of the cash is not guaranteed or is contingent on exerting considerable effort, the same individuals may even resort to less ethical means of accomplishing the focal goal precisely because the outcome of expending effort (*i.e.*, getting the incentive) is viewed as more important than the effort stream itself.

The experiments in Chapter 2, which address habit formation, demonstrated that people incentivized with cash were more likely to meet the minimum goals required to earn the bonus; however, on (perhaps less conspicuous) metrics such as engagement in the focal activity and longer-term persistence, they performed decidedly worse. I briefly summarize below some key predictions corresponding to the three relevant areas of behavior that we will explore.

*Choice of reward contract.* First, I consider people's choices between different reward specifications as a function of the incentive type (monetary or nonmonetary): How do they tradeoff the magnitude of a reward with its risk (*e.g.*, probability) or delay? If indeed cash incentives are likely to incite concerns about compensation (more so than noncash incentives of equivalent monetary value), then I expected individuals who could earn cash to gravitate toward reward contracts that allow them to attain a payment with certainty (*i.e.*, for sure) and with haste (*i.e.*, now)—even when another contract offers a payment with greater expected value or net present value but at the cost of uncertainty or delay, respectively.

*Goal setting.* Relatedly, the same compensation focus induced by cash incentives has implications for the kinds of goals and effort streams that people set or choose. Specifically, compared to noncash hedonic rewards, individuals faced with cash incentives should tend to impose easier goals for themselves—goals with lower effort thresholds that minimize the risk of failing to attain their compensation. By the same logic, they will tend to opt for easier tasks (that offer smaller rewards) with over harder tasks (that offer larger rewards) in the interest of guaranteeing nonzero payoff.

*Integrity.* Lastly, turning to people's behaviors exhibited during the course of goal pursuit, I predicted that providing a cash incentive (as opposed to no incentives or a noncash tangible incentive) to complete a task will shift people's focus to attaining the reward rather than the means by which they attain it. Consequently, individuals become more willing to cut corners when given the opportunity to do so, for the sake of maximal monetary gain: They may cheat more.

### **3.3 Overview of Studies**



I tested the above propositions in multiple studies that compare the effects of cash against noncash rewards in shaping choices and behavior. Convergent evidence across six sets of studies suggests a heightened focus on compensation when individuals encounter cash, compared to noncash hedonic, contingent rewards.

Study Series 1 and 2 investigated how people make tradeoffs between the magnitude of a reward and its risk and delay, respectively, as a function of the type of rewards (monetary or nonmonetary) they face. Prior work suggests that the preference for immediacy in intertemporal choice and the preference for certainty in risky choice are connected (*e.g.*, Mischel and Grusec 1967; Prelec and Loewenstein 1991; Rotter 1954; see also Urminsky and Kivetz 2011); I therefore analyzed decisions under both paradigms. To preface the key results, I found that contingent cash incentives, relative to noncash (but extrinsic) hedonic prizes of equivalent monetary value, led participants to: (i) choose contracts offering a certain but smaller (vs. uncertain but larger) reward (Studies 1a-1c); (ii) opt for contracts offering an immediate but smaller (vs. delayed but larger) reward (Studies 2a-2b); and (iii) set, as well as select, easier performance goals and tasks (Studies 3a-3d).

I subsequently identified two factors under which the above preferences are less likely to hold: (i) the withdrawal of effort requirements or incentive contingency (Studies 4a-4b); and (ii) the removal of *absolute* certainty or immediacy in gaining a focal reward (Studies 5a-5b). Study Series 6 further examined a behavioral consequence of “compensation focus” in the form of reduced integrity when completing a task. Across three incentivized, real-effort paradigms, I found that people cheated more when they faced the prospect of earning cash as opposed to noncash, hedonic rewards for exceeding a given performance threshold (as well as compared to unrewarded controls).

Finally, I elicited individuals’ lay predictions under joint evaluation—that is, when people can choose directly between cash-based and noncash-based alternatives. Despite their revealed preferences and behaviors, the vast majority stated that they would prefer incentive contracts whose

rewards are denominated in cash (vs. hedonic prizes) and would find such contracts more motivating.

The studies reported herein feature responses from paid U.S. workers recruited from Amazon Mechanical Turk (MTurk) with at least a 96% approval rating. I excluded data from individuals who failed an attention check, although the results I report throughout are robust to their inclusion. All eligibility and exclusion criteria were determined in advance.

### **3.4 Study Series 1: Cash Incentives Increase Preference for Guaranteed Rewards**

People frequently trade off how *likely* they are to earn a reward with how *much* they can earn. In such circumstances involving tradeoffs between magnitude and probability, I argue that a key—and, in some sense, definitional—aspect of a greater compensation focus (as laid out in Section 3.2) is the expectation of receiving something “for sure” in return for expending effort. How might people’s relative preference for a smaller but certain incentive differ as a function of the type of rewards (cash or noncash) they face?

In Study Series 1, I tested the hypothesis that when people are offered cash, relative to nonmonetary (*e.g.*, hedonic) rewards, as an incentive for meeting a specified performance level or goal, they are more likely to prefer contracts with *guaranteed* incentives—even at the cost of lower earnings. To quantify how individuals trade off the magnitude and probability of a reward, I used a risky choice paradigm where participants chose between two programs (presentation order counterbalanced) intended to increase their daily walking activity: (i) Program A, which featured a certain but smaller reward; and (ii) Program B, which featured an uncertain but larger reward. These incentives were framed either in monetary (*i.e.*, cash) or in hedonic terms (*i.e.*, as a gift catalog consisting of 11 hedonic items, from which participants could select one prize, each with retail value

equivalent to the cash incentive). These items, selected based on responses from a pretest, included rewards such as a gift card to Starbucks Coffee, a box of gourmet chocolates, a gift card to an AMC movie theater, and a Groupon “Spa Day” gift card (see Appendix B1).

### 3.4.1 Study 1a: Exercise Programs

*Method.* Participants consisted of 327 respondents randomly assigned to either a cash incentive or noncash (hedonic) incentive condition. As part of a “Preferences and Evaluations” survey, I presented participants with a scenario where they could choose which of two exercise programs they preferred to join. Both programs lasted four weeks and encouraged members to walk at least 60,000 steps each week. For each week that a member met or exceeded the target goal of 60,000 steps, s/he would earn an incentive denominated in a given currency—either cash (in the cash incentive condition) or noncash (in the noncash incentive condition).

Specifically, participants assigned to the cash incentive condition read about Program A, which offered a smaller but certain reward (\$5 in cash), followed by Program B, which offered a larger but uncertain reward (entry into a raffle with a 1 in 20 chance to earn \$100 in cash).<sup>34</sup> For those assigned to the noncash incentive condition, the smaller but certain reward consisted of the participant’s choice of one smaller item (with retail value of \$5) from a predetermined gift catalog, while the larger but uncertain reward consisted of an entry into a raffle with a 1 in 20 chance of earning the participant’s choice of one larger hedonic reward (with retail value of \$100) from the same gift catalog. I counterbalanced the order in which these two programs appeared on the page. As the primary dependent measure, I asked participants to choose the program they would rather join, assuming they could only enroll in one.

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<sup>34</sup> Programs A and B were presented simultaneously (*i.e.*, on the same page).

*Results and discussion.* The order of presentation did not affect choice shares ( $\chi^2(1) = 1.76, p = .19$ ) or interact with incentive condition to affect choice shares ( $\chi^2(1) = .19, p = .66$ ). Hence, I report the rest of the findings collapsed across presentation order.

Consistent with general risk aversion and the certainty effect (Kahneman and Tversky 1979), participants in both incentive conditions were more likely to choose the program offering the smaller-certain (over larger-uncertain) reward (80%<sub>cash</sub>,  $\chi^2(1) = 59.40, p < .001$ ; 69%<sub>noncash</sub>,  $\chi^2(1) = 23.73, p < .001$ ). However, this preference for the smaller-certain reward was stronger among those in the cash, compared to noncash, group ( $\chi^2(1) = 5.09, p = .02$ )— suggesting that cash incentives may prompt greater “stickiness” toward compensation schemes that are guaranteed (but of a smaller magnitude).

### 3.4.2 Study 1b: Language Learning Programs

In Study 1b, I tested whether cash incentives shift preferences toward smaller but guaranteed rewards using a different scenario of required effort and goal.

*Method.* Participants were 356 respondents, assigned to either a cash or noncash incentive condition, who chose between two foreign language reward programs (presentation order counterbalanced). Both programs lasted eight weeks and required members to take an exam at the end of each week covering the grammar and vocabulary taught during that past week. For each week a member passed the exam, s/he would earn a bonus reward denominated in either cash (cash incentive condition) or hedonic currency (noncash incentive condition).

Participants who were randomly assigned to the cash incentive condition read about Program A, which offered a smaller but certain reward (\$5 in cash), followed by Program B, which offered a larger but uncertain reward (entry into a raffle with a 1 in 10 chance to earn \$50 in cash). In the noncash incentive condition, the smaller but certain reward consisted of the participant’s

choice of one small hedonic reward (with retail value of \$5) from the same catalog used in study 1a, while the larger but uncertain reward consisted of an entry into a raffle with a 1 in 10 chance of earning their choice of one larger hedonic reward (with retail value of \$50) from the same catalog. Again, the dependent measure of interest was which incentive program participants chose to join.

*Results and discussion.* Presentation order did not affect choice shares ( $\chi^2(1) = .55, p = .46$ ) or interact with incentive condition to affect choice shares ( $\chi^2(1) = .10, p = .75$ ). Collapsed across presentation order and consistent with risk aversion, participants in both incentive conditions were more likely to choose the program with the smaller-certain reward over the program with the larger-uncertain reward (cash condition: 77%,  $\chi^2(1) = 51.78, p < .001$ ; noncash condition: 68%,  $\chi^2(1) = 23.01, p < .001$ ). Importantly, however, this tendency to prefer the smaller-certain (vs. larger-uncertain) reward was stronger among those in the cash condition compared to those in the noncash condition ( $\chi^2(1) = 3.60, p = .06$ ).

That a similar pattern of results emerged for both the exercise and foreign language scenarios indicates that contingent cash incentives enhanced the preference for guaranteed (but lower magnitude) rewards over probabilistic (but higher magnitude) ones. This, I believe, is consistent with a greater compensation focus that performance-based monetary rewards induce.

### 3.4.3 Study 1c: Exercise Programs (Greater Expected Value for the Uncertain Reward)

The previous two studies both featured reward options whose expected values were equivalent (*i.e.*, \$5 in each case). Do cash incentives lead people to prefer guaranteed reward contracts even when they must give up a greater expected value? To test this, Study 1c followed the same procedure as Study 1a but adjusted the expected value of the larger but probabilistic reward such that it exceeded that of the smaller but certain reward.

*Method.* I randomly assigned 230 participants to either a cash or noncash incentive condition. Participants faced the scenario used in Study 1a, choosing between two exercise programs that offered a bonus reward for walking at least 60,000 steps each week.

I increased the magnitude of the larger-uncertain reward, giving it a higher expected value relative to the guaranteed reward. Thus, participants in the cash incentive condition read about Program A, which offered a smaller but certain reward (\$5 in cash), followed by Program B, which offered a larger but uncertain reward (entry into a raffle with a 1 in 20 chance to earn \$120 in cash; *i.e.*, expected value of \$6). For those in the noncash incentive condition, the smaller but certain reward consisted of the participant's choice of one hedonic reward (worth \$5) from the gift catalog used previously, while the larger but uncertain reward consisted of an entry into a raffle with a 1 in 20 chance of earning the participant's choice of one larger hedonic reward (worth \$120) from the same catalog.

*Results and discussion.* As with the previous studies, people were overall risk averse, with participants in both incentive conditions favoring the program offering the smaller-certain (over larger-uncertain) reward (cash condition: 75%,  $\chi^2(1) = 28.75, p < .001$ ; noncash condition: 62%,  $\chi^2(1) = 6.23, p = .013$ ). However, even when the expected value of the guaranteed alternative was lower, the tendency to choose the smaller-certain reward over the larger-uncertain reward remained stronger among those in the cash condition compared to those in the noncash condition ( $\chi^2(1) = 4.97, p = .026$ ).

Taken together, the results of Studies 1a through 1c provide evidence that relative to noncash hedonic rewards, cash incentives enhance preference for guaranteed rewards: People were willing to sacrifice a higher magnitude, as well as expected value, to secure their compensation.

### 3.5 Study Series 2: Cash Incentives Increase Preference for Immediate Rewards

Using the context of risky choice, Study Series 1 provides evidence of an overall preference shift toward smaller but certain incentives over larger, less certain ones—when such incentives are denominated in cash rather than noncash (hedonic) terms. I argue that this preference for guaranteed (but lower) over probabilistic (but higher) monetary rewards not only reflects an overall attraction to alternatives that promise a “safe” payoff but also follows from a greater compensation focus.

Another related consequence of a heightened focus on compensation involves tradeoffs involving time. Specifically, I anticipated that individuals preoccupied with being compensated will tend to strongly weight incentives that they can receive now rather than later. Under such a mindset, people are more likely to believe they are *entitled* to a reward as due payment for investing effort—and in particular that they not only should attain it for sure but also immediately.

Prior work in the behavioral decision-making literature suggests that the preference for immediacy in intertemporal choice and the preference for certainty in risky choice are connected and may often operate in parallel (*e.g.*, Mischel and Grusec 1967; Prelec and Loewenstein 1991; Quiggin and Horowitz 1995; Rotter 1954; see also Urminsky and Kivetz 2011). For example, Quiggin and Horowitz (1995) use Rank Dependent Expected Utility as a basic uncertain choice model to derive a “natural analogy between risk-aversion and impatience” (p. 37). In the studies below, I tested the prediction that analogous to a greater preference for certain over uncertain rewards, cash (relative to noncash, hedonic) incentives would enhance the preference for immediate over delayed rewards.

#### 3.5.1 Study 2a: Exercise Programs

*Method.* Two-hundred and eighty-two (282) respondents, randomly assigned to a monetary incentive or a noncash incentive condition, considered two exercise programs (A and B; order counterbalanced) similar to the scenario I used in Study 1a. Both programs lasted one week (described as a trial run), and both offered members a reward for walking at least 60,000 steps at the end of the week. In the cash incentive condition, participants read about Program A, which offered a smaller reward (\$20 in cash) that they would receive immediately, as well as Program B, which offered a larger reward (\$30 in cash) that they would receive in two months after the trial run. In the noncash condition, the smaller but immediate reward consisted of the participant's choice of one hedonic item (with retail value of \$20) from the catalog used previously, while the larger but delayed reward consisted of their choice of one hedonic item (with retail value of \$30) from the same catalog. Participants then chose the exercise incentive program they preferred to join.

*Results and discussion.* Presentation order did not affect choice shares ( $\chi^2(1) = .21, p = .65$ ) or interact with incentive condition to affect choice shares ( $\chi^2(1) = 2.26, p = .13$ ). Whereas 67% of participants in the cash incentive condition chose the program with the immediate but smaller reward over the program with the delayed but larger reward, only 45% of participants in the noncash incentive condition chose the program with the immediate but smaller reward. I found the analogous pattern for intertemporal choice as I did under the risky choice paradigm: The tendency to prefer the smaller-immediate (vs. larger-delayed) incentive was more pronounced among participants in the cash compared to noncash incentive condition ( $\chi^2(1) = 12.75, p < .001$ ). In other words, cash incentives increased people's preference for reward contracts with a lower payoff but which they can receive *now*.

### 3.5.2 Study 2b: Language Learning Programs



*Method.* To test whether cash incentives shift preferences toward smaller but immediate rewards in a different context, Study 2b repeated the paradigm from Study 2a using the language learning scenario. Participants were 353 respondents, assigned to either a monetary or noncash incentive condition, whom I instructed to imagine that they were interested in joining a summer online language program to increase their knowledge of a foreign language. They subsequently chose between two such programs in their area (Programs A and B, order counterbalanced). Each program was described to last two months (eight weeks) with a trial run of one week, and as part of the curriculum all members would take an exam at the end of each week. If a member passed the exam after the first week (trial run), s/he would earn a reward denominated in either cash (cash condition) or noncash terms (noncash condition). Program A granted a smaller incentive of \$20 (in either cash or hedonic prizes) to be received immediately, while Program B offered a larger incentive of \$30 (in either cash or hedonic prizes) to be received in two months after the trial run.

*Results and discussion.* Presentation order did not affect choice shares ( $\chi^2(1) = .01, p = .93$ ) or interact with incentive condition to affect choice shares ( $\chi^2(1) = 1.52, p = .22$ ). Whereas 53% of participants in the cash incentive condition chose the program with the immediate but smaller reward over the program with the delayed but larger reward, only 38% of participants in the noncash incentive condition chose the program with the immediate but smaller reward ( $\chi^2(1) = 7.94, p = .005$ ). Again, people opted for the alternative that secured them an immediate (albeit lower magnitude) payoff.

### **3.6 Study Series 1-2: Discussion**

In concert, Study Series 1 and 2 provide evidence consistent with a compensation focus underlying the provision of (contingent) monetary incentives. Participants were more likely to favor incentive

systems with smaller but guaranteed or immediate rewards over larger but uncertain or delayed rewards when these rewards were in the form of cash compared to noncash, hedonic prizes.

One possibility that may account for these results is that people simply perceived \$5 in cash as more valuable or “worth more” than those who were presented with the same amount in a gift card. This may lead participants to construe the difference in attractiveness between the larger and smaller hedonic rewards as greater than the difference in attractiveness between the larger and smaller cash incentives (a case of asymmetric scope sensitivity). However, prior research and my own data cast some doubt on this explanation. First, evidence on the affective psychology of value (Hsee and Rottenstreich, 2004; Rottenstreich and Hsee 2000) suggests that, if anything, individuals tend to be more scope sensitive to changes in monetary units than nonmonetary (*i.e.*, typically more affect-laden) ones. Second, previous work comparing consumers’ evaluations of cash and noncash rewards found preference reversals in which people favored cash under joint evaluation but gave higher ratings to the noncash alternative under separate evaluation (*e.g.*, Kivetz and Simonson 2002b; Shaffer and Arkes 2009).

Lastly, to more directly examine the “differential valuation” account, I ran a posttest on a separate pool from the same sample. Participants ( $N = 269$ ) assigned to one of two incentive conditions (cash vs. noncash) read information about the same two reward programs used in the exercise scenario from Study 1a. Rather than asking people to choose between the contracts, however, I had them evaluate the bonus reward offered by each. Specifically, participants indicated on a 3-item scale to what extent they found the bonus attractive, desirable, and rewarding ( $1 =$  Not at all;  $5 =$  Very much). I counterbalanced the order in which participants viewed the two programs (*i.e.*, one with a small but certain reward, the other with a larger but uncertain one).

I averaged the three scale items to obtain an index of perceived attractiveness ( $\alpha_{\text{small-certain}} = .96$ ;  $\alpha_{\text{large-uncertain}} = .93$ ). Because order of presentation affected participants’ responses on this

measure for both programs (small-certain:  $F(1,265) = 7.87, p = .005$ ); large-uncertain:  $F(1,265) = 11.01, p = .001$ ) and interacted with condition (small-certain:  $F(1,264) = 5.10, p = .025$ ; large-uncertain:  $F(1,265) = 3.08, p = .08$ ), I consider only the between-subjects effect on the first program participants evaluated (see Figure 21).

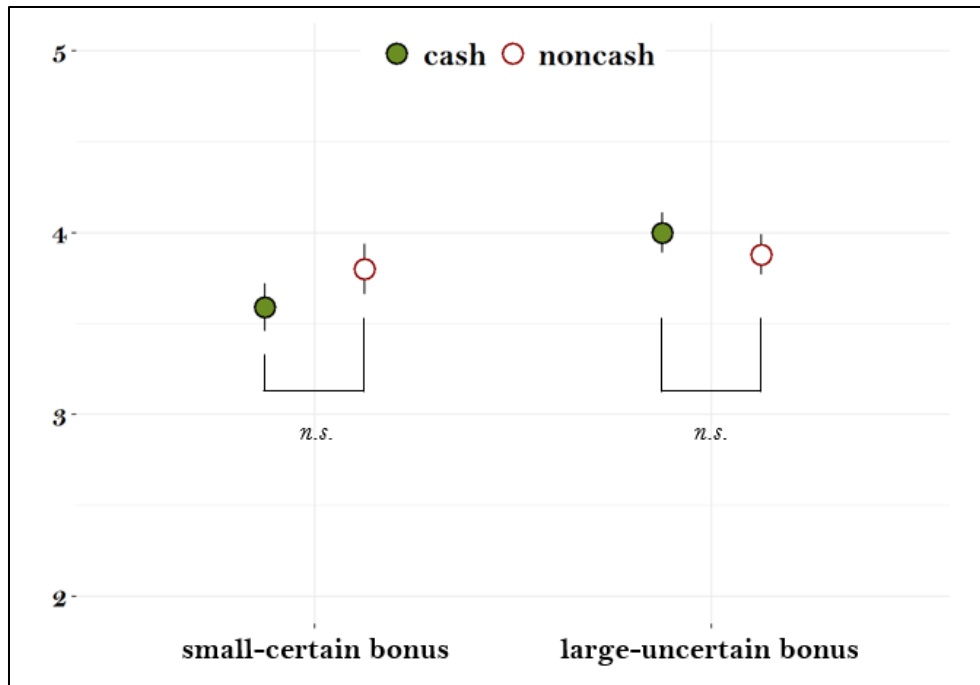


Figure 21: Perceived attractiveness (indexed) of bonus reward offered in each incentive contract used in Study 1a. Error bars are standard errors ( $\pm 1$  SEM).

Participants in the noncash incentive condition rated the small but certain bonus as equally attractive compared to those who saw the equivalent amount in cash ( $M_{\text{noncash}} = 3.80, M_{\text{cash}} = 3.59$ ;  $F(1,134) = 1.21, p = .27$ ). The same was true among those who rated the contract with the large but uncertain bonus ( $M_{\text{noncash}} = 3.88, M_{\text{cash}} = 4.00$ ;  $F(1,131) = .71, p = .40$ ). Hence, at least under the separate evaluation paradigm I used in Study Series 1 and 2, cash does not appear to be *inherently* perceived as more valuable or rewarding than noncash incentives of equal market value.

### 3.7 Study Series 3: Cash Incentives Increase Preference for Easier Goals

The first two study series found that relative to noncash hedonic rewards, cash incentives led individuals to prefer incentive contracts with guaranteed or immediate (but lower magnitude) rewards over contracts with probabilistic or delayed (but higher expected value or net present value) ones. In other words, when they could earn cash, people were willing to sacrifice how much they could attain in favor of attaining their compensation for sure and immediately.

A related question is whether varying the effort stream itself produces similar effects to changing the probability of a reward. Easier goals tend to give rise to more certain outcomes, whereas harder goals typically come with greater risks. Does imposing a more challenging goal—*i.e.*, that demands greater effort—operate analogously to injecting uncertainty into the reward itself (as I did previously when the uncertain alternative consisted of a lottery)? To test this, Study 3a framed the tradeoff between magnitude and probability in terms of the effort expenditure required to earn a focal reward.

#### 3.7.1 Study 3a: Choosing Easier Goals

*Method.* Participants were 178 respondents assigned to either a cash or a noncash incentive condition. Following the same scenario from Study 1a, I asked people to choose between two exercise incentive programs in their area. In the cash incentive condition, they chose between Program A, which offered a smaller reward (\$5 in cash) for meeting a relatively easier weekly step goal (30,000 steps), and Program B, which offered a larger reward (\$10 in cash) for meeting a relatively harder weekly step goal (75,000 steps). Participants in the noncash incentive condition saw

the same information except that they were offered their choice of a hedonic item (with equivalent retail value) from a gift catalog.

Although both exercise programs featured contingent rewards that were non-probabilistic in nature (in contrast to the lottery-based options in Study Series 1), meeting the 30,000-step requirement of Program A is considerably easier and more feasible (if not guaranteed) than meeting the 75,000-step requirement of Program B—an assumption I corroborated in a separate posttest (see Appendix B2). Hence, people should be more likely to view Program A's incentive contract as smaller but essentially certain compared to Program B's larger but more uncertain contract.

*Results and discussion.* Whereas 56% of participants in the cash incentive condition chose the program with the smaller reward but easier step goal over the program with the larger reward but harder step goal, only 36% of those in the noncash incentive condition did so ( $\chi^2(1) = 7.20, p = .007$ ). This effect of incentive currency on choice indicates that, consistent with the findings described in Study Series 1, cash incentives induce a preference for rewards that are guaranteed—in this case by virtue of being easy (or trivial) to obtain. Such behavior may be detrimental to goal pursuit, as it effectively signals a willingness to opt for safer courses of action that award lower earnings for accomplishing less challenging tasks.

### 3.7.2 Study 3b: Setting Easier Goals (Open-Ended)

*Method.* Study 3a's results suggest that cash incentives shift choices toward incentive contracts that are considered safer insofar as they ensure receipt of the effort-contingent reward. In Study 3b, I extend this idea by explicitly asking participants to state a target goal that would determine whether they are eligible to receive a focal reward. One hundred and sixty-three (163) participants, randomly assigned to either a cash incentive or a noncash incentive condition,

considered a month-long exercise incentive program in their area that encouraged members to walk “a certain number of steps each week that they set for themselves at the beginning.” The target program offered members a reward for meeting their self-specified target step goals; this reward consisted of \$5 denominated in either cash or hedonic currency corresponding to the incentive condition. As the dependent measure of interest, I asked participants to indicate, in an open-ended question, a weekly target step goal for themselves.

*Results and discussion.* Participants in the cash incentive condition specified a lower effort threshold for themselves (*i.e.*, a goal consisting of fewer steps) compared to those in the noncash reward condition ( $M_{\text{cash}} = 23,496$  steps vs.  $M_{\text{noncash}} = 34,534$  steps; Mann-Whitney  $U = 2570.50$ ,  $p = .017$ ). Figure 22 illustrates this discrepancy.

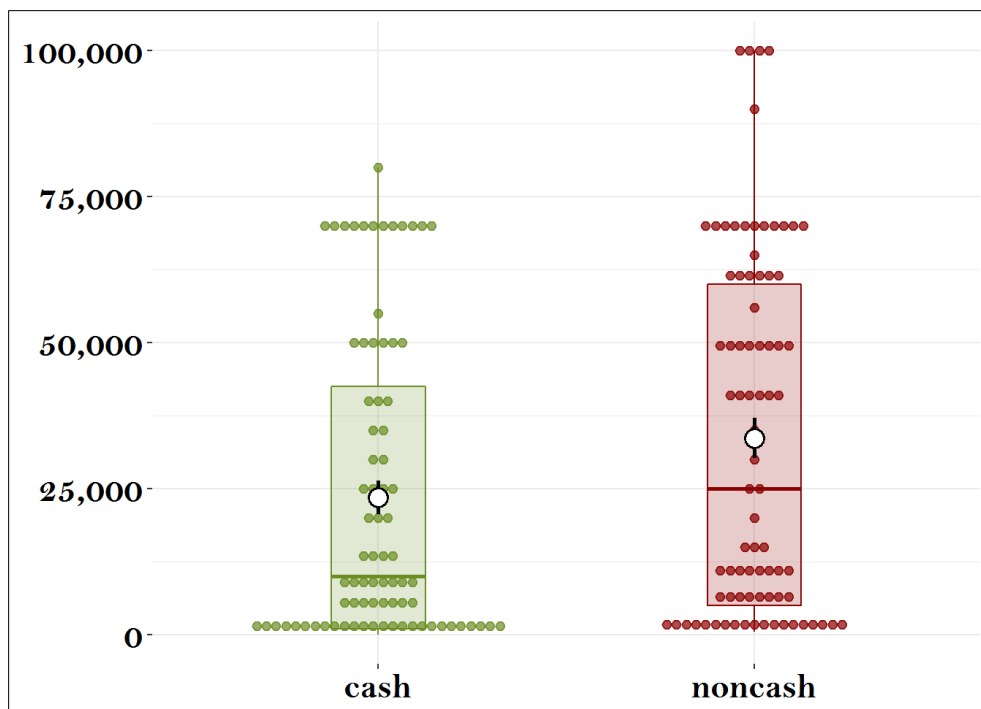


Figure 22: Distribution of self-imposed step goals (Study 3b). Each dot is an individual’s response. Average self-imposed steps for each incentive condition are overlaid. Error bars are standard errors ( $\pm 1$  SEM).

Looking at the entire distribution of self-stated step goals, we see that the majority of participants specified nonzero step goals. However, albeit sparse, the data toward the lower extreme of the distribution suggest that the prospect of cash incentives increased the likelihood of providing economically rational—but unrealistic—responses. Four participants in the cash incentive condition indicated a step goal below 100 steps, while no participants in the noncash condition set a goal within this range (Fisher’s exact: unadjusted odds ratio = 1.05, 95% CI [1.00, 1.11]),  $p = .056$ ). Similarly, 16% of those in the cash condition specified below 1,000 steps per week, compared to 5% in the noncash condition ( $\chi^2(1) = 4.70, p = .017$ ).

To summarize, the effect of incentive currency on self-determined step thresholds indicates that compared to noncash hedonic rewards, cash incentives led individuals to set easier goals for themselves (*i.e.*, with relaxed effort requirements) to guarantee receipt of the accompanying reward. In this regard, cash may disincentivize incremental effort expenditure and demotivate people from aspiring to attain stretch goals.

### 3.7.3 Study 3c: Specifying Easier Goals (Closed-Ended)

*Method.* In Study 3c, I attempted to replicate and further build on the previous two studies. Would we see the same shift toward “safer” regimens under contingent cash incentives when people can indicate their preferred threshold of effort expenditure in a closed-ended (rather than open-ended) format? Although the results of Study 3b were robust to outliers, it is reasonable to assume that people may not have a good sense of how much they are capable of walking. To impose some bounds on the range of responses, the present study followed an identical procedure to Study 3b except that participants could choose from a preselected list of minimum step thresholds with varying levels of difficulty and, hence, varying (implicit) probabilities of attaining the reward.

I randomly assigned 157 participants to either a cash incentive condition or a noncash incentive condition. Again, I asked everyone to imagine that they were interested in joining an exercise incentive program and subsequently had them read about one such month-long program. Program members were encouraged to walk “a certain number of steps each week that they set for themselves at the beginning” and would earn a reward for each week that they met or exceeded their self-specified target step goal.

In the cash incentive condition, the reward consisted of \$5 in cash, whereas in the noncash incentive condition, it consisted of the participant’s choice of one item (with retail value of \$5) from the same hedonic gift catalog used in previous studies. As the dependent measure, I asked participants to select a minimum weekly target step goal for themselves out of 11 options presented in a multiple-choice question. The options ranged from “5,000+ steps each week” to “100,000+ steps each week” in 10,000-step increments (apart from the gap between the first two options given by “5,000+ steps” and “10,000+ steps”).

*Results and discussion.* Participants randomly assigned to the cash incentive condition tended to select options that corresponded to lower effort thresholds (*i.e.*, consisting of a lower minimum step goal) compared to participants assigned to the noncash reward condition ( $M_{\text{cash}} = 17,911$  steps vs.  $M_{\text{noncash}} = 27,647$  steps; Mann-Whitney  $U = 2246$ ,  $Z = -1.75$ ,  $p = .08$ ). Examining the distribution of responses (see Figure 23) reveals that as the minimum step goal increases, the direction of the differences between the cash and noncash incentive conditions reverses: Whereas individuals who could earn cash were more likely to select effort thresholds up to 40,000 steps per week than those who could earn a noncash hedonic reward, the opposite pattern emerged for thresholds of 50,000 steps per week or higher. In particular, 91% of participants in the cash incentive condition selected minimum goals below 50,000 steps per week compared to only 68% in the noncash reward condition ( $\chi^2(1) = 12.75$ ,  $p < .001$ ).



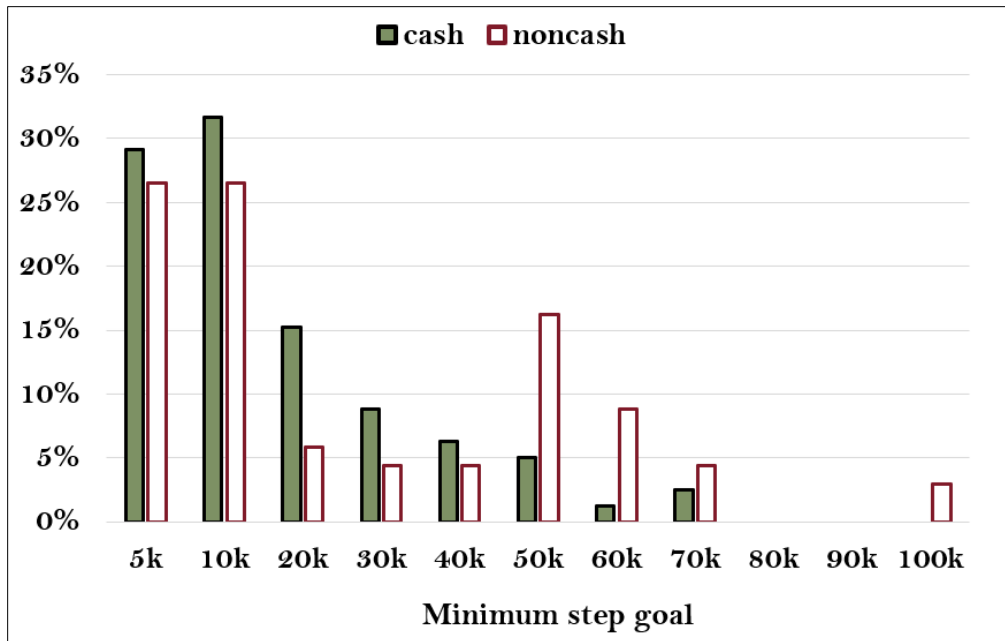


Figure 23: Choice shares of selected step goals (Study 3c).

In keeping with the idea that monetary rewards induce greater compensation focus, the above results further demonstrate that compared to noncash (hedonic) rewards, cash incentives caused people to set lower (*i.e.*, easier and less ambitious) effort thresholds as a means of guaranteeing their contingent compensation.

### 3.7.4 Study 3d: Choosing Easier Tasks

The preceding studies in this series examined people’s stated preferences between, on the one hand, easier tasks that come with smaller rewards and, on the other hand, harder tasks that come with larger rewards. Notably, these studies imposed this tradeoff in the context of hypothetical scenarios in which effort is involved but not actually expended. Would the same pattern hold under incentive-compatible conditions—that is, with consequential choices and real effort expenditure? To answer this, Study 3d tested whether people faced with cash (vs. noncash) performance incentives are more

likely to choose safer (*i.e.*, low-risk but low-reward) alternatives when they must invest effort to earn real incentives. I additionally had individuals retrospectively evaluate how much they were focused on challenging themselves to complete the task (reflecting a “process”-oriented attitude) relative to how much they were focused on simply attaining the incentive (reflecting an “outcome”-oriented attitude). In accordance with a greater compensation focus, I posited that people incentivized with cash (vs. hedonic rewards) would focus more on the outcome of attaining the incentive than on the process of engaging with the task itself.

*Method.* I randomly assigned 223 participants to one of three conditions: a no-incentive control condition, a cash incentive condition, and a noncash incentive condition. Rather than asking people to imagine a hypothetical scenario about joining an exercise or language learning reward program, I gave participants the choice of working on one of two ostensibly “randomly selected” tasks related to cognitive perceptions.

All participants proceeded to a “Word Search Puzzles” page detailing the task (see Appendix B3 for a comprehensive tabulation of stimuli). The instructions indicated that they would be asked to solve a word search puzzle of their choice with a pre-generated topic category (*e.g.*, “Sports”) by finding as many *target words* as they could within a given amount of time. I defined target words as valid English words hidden in the word search puzzle that belong to (*i.e.*, are examples of) the given category; such words could appear horizontally, vertically, or diagonally, be oriented forwards or backwards, and could occasionally share letters across different words. Participants read that “[t]he word search will display the total number of target words in that puzzle but NOT the words themselves” and that the difficulty level would range from easy to difficult depending on the puzzle, with larger grid sizes corresponding to more difficult puzzles. Finally, I displayed a screenshot of a sample word search puzzle with a “moderate difficulty rating” (composed of a 10×10 grid of letters) to give participants a preview of the task (see Figure 24).

The difficulty level of the word searches will **range from easy to hard** depending on the puzzle. The larger the grid size of the word search, the harder it is to find all the target words.

To give you a sense of what you might see, below is a sample word search with a difficulty rating of **Moderate** (10 x 10 grid):

Category: **COLORS**  
# of target words: **10**  
Time limit: **9 minutes**

C	T	Z	O	H	S	C	N	N	W
D	N	B	A	I	N	E	E	R	G
K	K	W	L	P	H	W	P	F	A
P	J	V	O	U	O	W	I	U	D
O	E	S	C	R	E	E	N	X	H
R	R	U	S	P	B	T	K	Z	N
X	F	A	H	L	R	I	P	A	T
C	D	V	N	E	M	H	W	J	T
A	J	N	D	G	M	W	M	H	F
B	L	A	C	K	E	N	J	W	C

Target word 1:

Target word 2:

Target word 3:

Target word 4:

Target word 5:

Target word 6:

Target word 7:

Target word 8:

Target word 9:

Target word 10:

In this example, the correct target words hidden in the puzzle are: "green", "black", "purple", "white", "blue", "orange", "red", "brown", "pink", and "silver".

Figure 24: Sample preview of word search puzzle task (Study 3d).

After reading the instructions, participants saw information about two different word search puzzles on which they could choose to work. The first (“Word Search Puzzle M”) featured a difficulty rating of “Easy”, with an 8×8 grid size, 10 target words, and a time limit of nine minutes), while the second (“Word Search Puzzle R”) carried a difficulty rating of “Hard”, with a 14×14 grid size, 10 target words, and the same time limit). Participants randomly assigned to the control group saw no other information before indicating their choice between the two puzzles and proceeding to the selected task. Prior to making their choice, participants randomly assigned to either of the two incentive conditions learned about a performance-contingent reward offered for each of the puzzles.

In the cash incentive condition, Puzzle M offered participants \$5 in cash if they correctly identified at least 80% of the total target words, whereas Puzzle R offered \$10 for reaching the same performance threshold. Those in the noncash incentive condition read the same information except that the reward would be their choice of one item with retail value of \$5 or \$10 (corresponding to the easy or difficult puzzle, respectively) from the hedonic catalog used in the prior studies. Choice shares of the difficult word search puzzle (over the easy one) served as the primary dependent measure.

I equated the two word search puzzles on all parameters except for the grid size, which governed the difficulty level. Both puzzles used “Animals” as their category, contained the same 10 target words, and allotted nine minutes before the page advanced. Upon completing their chosen word search, participants rated how difficult they perceived the task to be, as well as the extent to which they were “more focused on challenging yourself to complete the task” (1) or “more focused on receiving the reward” (7). (For individuals in the control condition, who did not read about any incentive, the “reward” was the noncontingent participation fee for completing the survey.) Those in the two incentive treatments who correctly identified at least 80% of the words received the incentive corresponding to their condition and puzzle choice.

*Results and discussion.* Choice shares of the more difficult word search puzzle differed by incentive condition ( $\chi^2(2) = 7.64, p = .02$ ), with 35%, 32%, and 53% of participants in the control, monetary incentive, and noncash incentive conditions, respectively, choosing to work on the hard puzzle over the easy one. Those who could attain cash incentives were equally as likely as those in the control condition to select the difficult puzzle ( $p = .77$ ) and less likely to select the difficult puzzle than those in the noncash incentive condition ( $p = .01$ ), who were in turn more likely to do so than those in the control condition ( $p = .02$ ).

Responses to the “outcome versus process focus” scale varied by incentive condition ( $F(2,220) = 17.60, p < .001$ ). In particular, participants in the cash incentive condition attended more to the outcome of receiving the incentive itself ( $M = 4.51 [SD = 2.13]$ ) compared to their counterparts in the control ( $M = 2.55 [1.87]; t(220) = 5.81, p < .001$ ) or noncash incentive condition ( $M = 3.18 [2.18]; t(220) = 3.94, p < .001$ ). Those in the latter group scored directionally higher on the “outcome versus process focus” measure than those in the control condition ( $t(220) = 1.86, p = .06$ ); however, in both cases, participants’ responses fell below the scale midpoint (control:  $t(74) = -6.73, p < .001$ ; noncash:  $t(73) = -3.25, p = .002$ ), indicating an overall focus on process over outcome. In contrast, responses among those assigned to the cash incentive condition fell above the scale midpoint ( $t(73) = 2.07, p = .04$ ), indicating an overall focus on outcome over process. Altogether, these patterns suggest that tasks which feature incentives denominated in monetary currency (vs. noncash currency or no bonus incentive at all) shift individuals’ emphasis toward the outcome of attaining the reward and away from the process of engaging in a given task.

How do these perceptions break down based on participants’ chosen task? A 3 (incentive condition: control vs. monetary vs. hedonic)  $\times$  2 (choice: easy puzzle vs. difficult puzzle) factorial ANOVA indicated a main effect of incentive condition ( $F(2,217) = 23.40, p < .001$ ), qualified by an incentive  $\times$  choice interaction effect ( $F(2,217) = 6.35, p = .002$ ; see Figure 25).

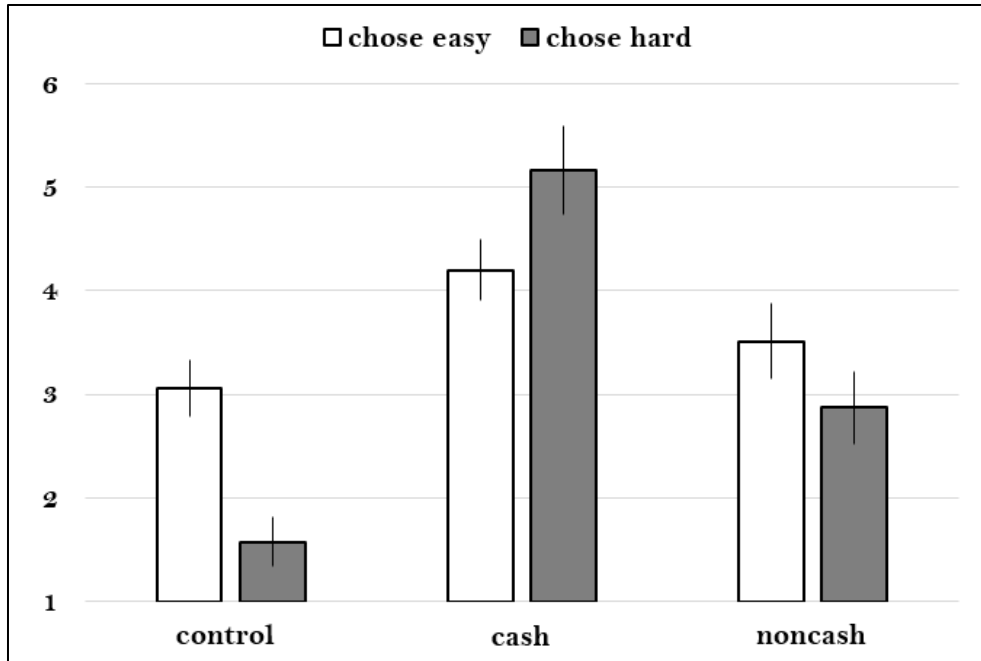


Figure 25: Self-reported focus on the outcome of receiving the reward (7) as opposed to the process of engaging in the puzzle task (1) (Study 3d). Error bars are standard errors ( $\pm 1$  SEM).

Specifically, among participants assigned to the control condition, reported “outcome” (as opposed to “process”) focus was higher for participants who chose the easy puzzle ( $M_{\text{easy}} = 3.06$  [ $SD = 1.95$ ],  $M_{\text{hard}} = 1.58$  [1.24];  $F(1,217) = 9.25$ ,  $p = .003$ ). In the cash incentive condition, this pattern reversed, such that participants who chose the difficult puzzle reported a higher outcome focus than those who chose the easy puzzle ( $M_{\text{easy}} = 4.20$  [2.09],  $M_{\text{hard}} = 5.17$  [2.12];  $F(1,217) = 3.75$ ,  $p = .05$ ). In contrast, those in the noncash condition scored equally low on this measure regardless of whether they chose the easy or difficult puzzle ( $M_{\text{easy}} = 3.51$  [2.15],  $M_{\text{hard}} = 2.87$  [2.19];  $F(1,217) = 1.88$ ,  $p = .17$ ). These patterns offer some insight into what participants valued conditional on what they chose. Absent any bonus, people who chose the difficult (vs. easy) puzzle reported directing their attention more to engaging themselves in a challenging task, consistent with a baseline intrinsic motivation effect. This pattern was attenuated for participants who could earn hedonic prizes: Those who selected the difficult task became more focused (relative to participants in the control

condition) on reward attainment. However, consistent with generating a greater compensation focus, cash-incentivized participants who selected the difficult puzzle did so primarily to receive the (larger) reward rather than to challenge themselves.

In sum, the above findings reveal that, in line with the results of Studies 3a-3c, the use of a cash currency increased people's tendency to select easier goals and tasks that promised a smaller payoff but greater odds of receiving the reward. These data also furnish some insight into the psychological mechanism by which cash incentives can demotivate people from pursuing harder goals—by evoking a preoccupation with compensation where they become more focused on the outcome of attaining an incentive rather than the process of engaging in the task or activity at hand.

Whether choosing between reward contracts or selecting their own performance goals and effort streams, participants were more attracted to smaller but guaranteed incentives when these incentives consisted of cash as opposed to hedonic rewards of equivalent retail value. Taken together, cash incentives appeared to not only enhance choice shares of smaller but guaranteed or immediate rewards at the expense of larger but uncertain or delayed rewards (Study Series 1-2) but also shift choices toward goals and tasks that are less challenging to complete—thereby making reward-attainment more likely (Study Series 3). Such behavior, I propose, typifies a key aspect of a heightened compensation focus: the emphasis on “settling for” rewards that are assured and easily won.

### **3.8 Study Series 4: The Role of Effort Requirements on Reward Preference**

The decisions I have investigated up until now have consisted of scenarios involving the provision of incentives that are contingent on some effort expenditure—whether that be in the form of steps

walked, exams passed, or word search puzzles solved. A natural question here is whether similar results would emerge if I were to sever the dependency between incentive and effort.

Recall that, as I posited in Section 3.2, the compensation focus elicited by monetary incentives implies a desire to secure more “bang for the buck.” This proposition encompasses an output-oriented component on the one hand, involving calculative considerations aimed at maximizing the magnitude of the reward (“What am I getting out?”), and an input-oriented element on the other hand, involving considerations aimed at minimizing costs and effort (“What am I putting in?”). An increased focus on compensation, I argue, entails a mental comparison between output and input when evaluating whether a focal reward justifies a given level of effort (see also Rottenstreich and Kivetz 2006). Judgments of the value of a cash incentive, then, are likely to be made in a transactive sense *relative to* the effort requirements in place. In the presence of such requirements, I predicted that people should be attracted to incentive structures that offer rewards they can get quickly and for sure (as “due payment” or “entitlement” for their efforts). However, sans any effort-reward contingency, cash-incentivized individuals—who are more likely to be focused on compensation—should be more likely to shift considerations toward maximizing expected (or net present) value and, in doing so, show less aversion to larger but uncertain or rewards.

Using the case of loyalty programs, Kivetz (2003) found that in the context of risky choice (*i.e.*, when trading off the magnitude and probability of a reward), consumers were more likely to prefer sure, small rewards over uncertain, large rewards when earning the rewards was contingent on expending a given amount of effort compared to when the rewards were given as free gifts. In other words, when there exists an effort-reward contingency, people seem to prioritize obtaining the incentive for sure (as opposed to risking the possibility of leaving empty-handed). In line with the hypothesis that cash incentives give rise to greater compensation focus, I predicted this kind of



expectation based on effort to be stronger when an incentive is denominated in cash (compared to noncash) terms.

### 3.8.1 Study 4a: The Effect of Effort Requirements on Preference for Guaranteed Rewards

*Method.* Participants were 211 respondents randomly assigned to one of four conditions in a 2 (incentive type: cash vs. noncash)  $\times$  2 (effort requirement: effort required vs. no effort required) between-subjects design. Following the risky choice exercise scenario from Study 1c, participants decided between a program offering a certain but smaller reward (\$5, in either cash or hedonic currency, corresponding to the incentive type condition) and one offering an uncertain reward with greater expected value (1 in 20 chance to receive \$120, in either cash or hedonic currency). Both programs encouraged members to walk at least 60,000 steps per week. I further randomized participants within each incentive type condition to one of two “presence of effort” conditions. In the “effort required” condition, individuals read that they would earn the focal reward only if they meet the weekly 60,000-step goal (identical to the instructions from Study Series 1). Those in the “no effort required” condition read, however, that they would earn the focal reward *regardless* of how many steps they walk.

*Results and discussion.* A binary logistic regression on the choice share of the smaller-certain incentive contract revealed a (directional) main effect of the “presence of effort” factor ( $B = .56$ ,  $SE = .41$ ,  $\chi^2(1) = 2.61$ ,  $p = .11$ ), qualified by a presence of effort  $\times$  incentive type interaction effect ( $B = -2.12$ ,  $SE = .62$ ,  $\chi^2(1) = 11.71$ ,  $p = .001$ ; see Figure 26).

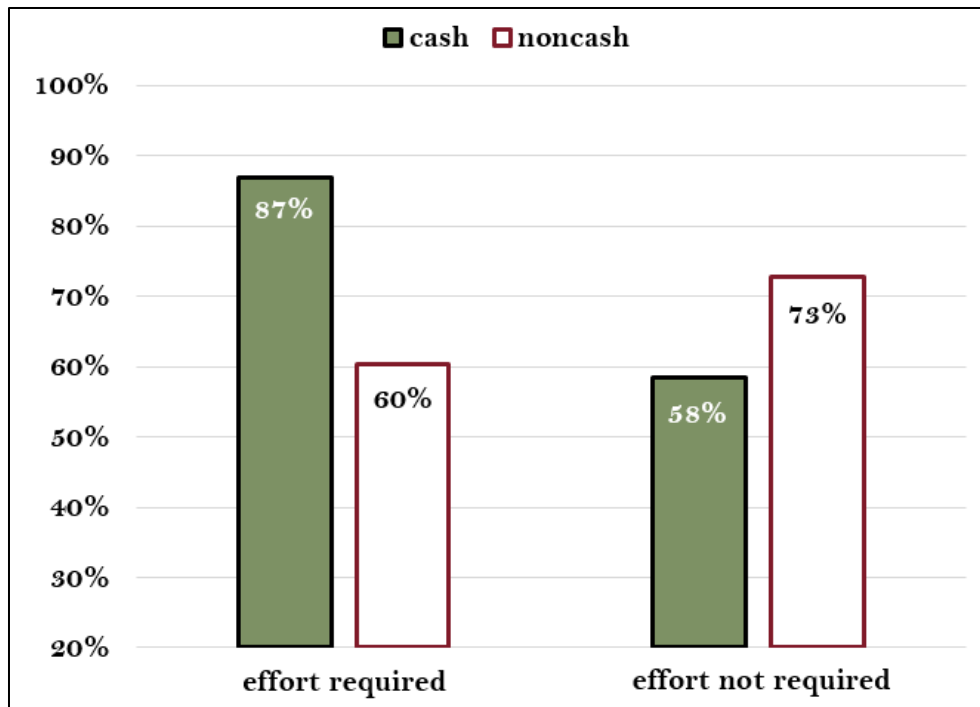


Figure 26: Choice share of exercise incentive program offering the smaller-certain (over larger-uncertain) reward (Study 4a).

Specifically, when effort was required (*i.e.*, when attaining the reward was contingent on meeting the step goal), participants were more likely to select the smaller-certain reward when offered cash as opposed to a noncash reward (87%<sub>cash</sub> vs. 60%<sub>noncash</sub>;  $\chi^2(1) = 11.47, p = .001$ )—replicating the patterns observed in Studies 1a and 1b. However, when effort was *not* required (*i.e.*, when members could earn the incentive regardless of how many steps they walked), this effect was eliminated: If anything, participants were slightly less likely to select the smaller-certain reward when they were in the cash as opposed to the noncash incentive condition (58% vs. 73%;  $\chi^2(1) = 2.39, p = .12$ ).

In other words, only when the incentive was contingent on reaching a performance threshold (necessitating a substantial degree of effort expenditure) did people facing cash incentives exhibit a stronger tendency to trade off reward magnitude for reward certainty. Absent this contingency, people who could earn a cash (vs. hedonic) incentive were more likely to focus on expected value calculations that favored the uncertain but larger reward.

### 3.8.2 Study 4b: The Effect of Effort Requirements on Preference for Immediate Rewards

In Study 4b, I assessed the analogous hypothesis for intertemporal choice—namely, that the relative greater preference for smaller-sooner (vs. larger-later) rewards induced by cash incentives would be diminished when the incentives are no longer contingent on performance. In particular, when I offer individuals a cash payment regardless of their effort expenditure, they should be more likely to opt for contracts that offer greater earning potential or net present value.

*Method.* I randomly assigned 356 respondents to one of four conditions in a 2 (incentive type: cash vs. noncash)  $\times$  2 (presence or absence of effort: effort required vs. no effort required to attain the incentive) between-subjects design. As in Study 2a, participants again chose between two exercise incentive programs, both of which encouraged members to walk at least 60,000 steps: one offered a smaller but immediate reward of \$20 immediately (denominated in either cash or hedonic currency), while the other offered a larger but delayed reward of \$30 in two months (in either cash or hedonic currency). In the “effort required” condition, participants could earn the reward only if they met or exceeded the 60,000-step goal. In contrast, those in the “no effort required” condition read that they could earn the reward *regardless* of how many steps they walked.

*Results and discussion.* A binary logistic regression on the choice share of the smaller-immediate incentive revealed a main effect of incentive type ( $B = .78$ ,  $SE = .30$ ,  $\chi^2(1) = 3.42$ ,  $p = .06$ ), qualified by an interaction between presence of effort and incentive type ( $B = -.77$ ,  $SE = .43$ ,  $\chi^2(1) = 3.18$ ,  $p = .075$ ; see Figure 27). When the incentive was contingent on effort, participants were more likely to select the smaller-immediate reward when they encountered monetary incentives as opposed to hedonic rewards (59%<sub>cash</sub> vs. 40%<sub>noncash</sub>;  $\chi^2(1) = 6.91$ ,  $p = .009$ )—replicating what we observed in

Study Series 2. However, when I removed any incentive contingency, this effect vanished (48% vs. 47%;  $\chi^2(1) = .002, p = .96$ ).

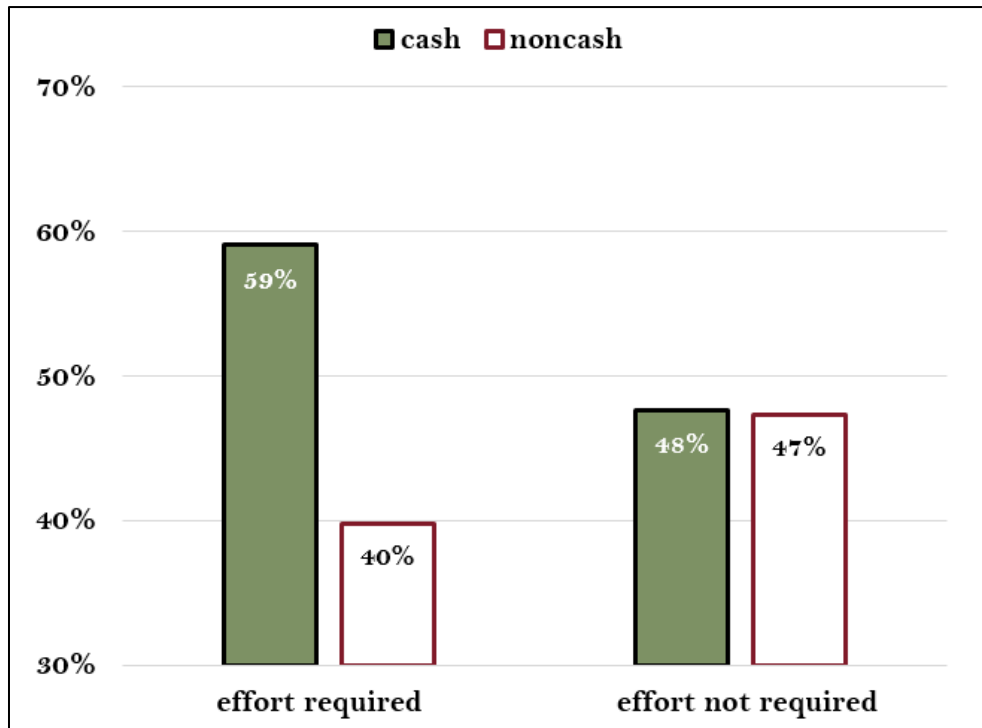


Figure 27: Choice share of exercise incentive program offering the smaller-immediate (over larger-delayed) reward (Study 4b).

Studies 4a and 4b together highlight the importance of effort-reward contingency when people make tradeoffs between a reward's magnitude and its probability and delay. Only when the incentive depended on reaching a goal or standard of effort investment did individuals motivated with cash (compared to those motivated with hedonic rewards) appear more willing to trade off reward magnitude in return for certainty (Study 4a) and immediacy (Study 4b). Absent such a contingency, cash incentives seemed to focus people more on expected value and net present value calculations that favored the larger but delayed alternative.

Recall the alternative account raised earlier, based on perceived desirability or attractiveness, which contends that participants in the noncash incentive condition may have been more willing to

select larger-uncertain rewards because they experienced greater scope sensitivity in their valuation of the hedonic items. If this were indeed the case, then we would expect to observe the same pattern of results in the “effort required” and “no effort required” conditions—which we did not. Thus, the above findings lend further support to an explanation based on compensation: When no labor is necessary to “earn” a reward (and hence nothing to compensate someone for), individuals incentivized with cash no longer become as tempted by the prospect of receiving the reward for sure or immediately.

### **3.9 Study Series 5: The Certainty and Immediacy “Premium”**

The results of Study Series 4 indicate that the requirement to expend effort can moderate when cash (compared to noncash) incentives increase the preference for smaller but certain, as well as smaller but delayed, rewards. In the next set of studies, I examine whether people evaluate these tradeoffs in the same way even when none of the offered incentives allow for complete certainty or immediacy.

Compensation focus, I have proposed, leads individuals to try and *guarantee* the receipt of an incentive as due payment in return for their effort. In doing so, they tend to place the *certainty* and *immediacy* of a reward above other considerations, such as its magnitude or expected value. However, offering a cash incentive with merely a greater probability (but not certainty) or temporal proximity (but not immediacy) may not be sufficiently enticing to override considerations of expected value. That is, when neither alternative gives the possibility of receiving something for sure or immediately, I expected people to exhibit greater attraction toward cash rewards that feature greater uncertainty or delay but which maximize expected, or net present, value.

### 3.9.1 Study 5a: Preference for Absolute Certainty

*Method.* I randomly assigned 346 respondents to one of four conditions in a 2 (incentive type: cash vs. noncash)  $\times$  2 (choice set: certainty present vs. certainty absent) between-subjects design. Under the same risky choice paradigm used in Study 1c, participants chose between two exercise programs that offered members a weekly reward (denominated in either cash or noncash, hedonic currency) conditional on meeting a target goal of 60,000 steps per week. I further assigned half of the participants in each incentive type condition to one of two choice sets. In the “certainty present” condition, participants faced the same choices as those in the “effort required” condition in Study 3a—that is, between one program with a smaller but *completely* certain reward (\$5, in either cash or hedonic currency) and a second program with a larger but uncertain reward (a 1 in 20 chance of \$120, in either cash or hedonic currency). Those assigned to the “certainty absent” condition confronted the same choice except that the program with the smaller reward also featured uncertainty, albeit to a lesser degree (1 in 10 chance to earn \$55).

*Results and discussion.* A binary logistic regression on the choice share of the smaller, less uncertain incentive revealed an incentive type  $\times$  choice set interaction ( $B = -.93$ ,  $SE = .48$ ,  $\chi^2(1) = 3.87$ ,  $p = .049$ ), with no main effects of either factor (see Figure 28). Among those in the certainty present condition, directionally more people exposed to the cash incentive (vs. noncash incentive) chose the program with the smaller-certain reward (75%<sub>cash</sub> vs. 68%<sub>noncash</sub>;  $\chi^2(1) = .86$ ,  $p = .36$ ). Yet, when both rewards were probabilistic, fewer participants in the cash incentive condition chose the smaller, less uncertain option compared to those in the noncash incentive condition (62%<sub>cash</sub> vs. 75%<sub>noncash</sub>;  $\chi^2(1) = 3.64$ ,  $p = .056$ ). While choice shares of the smaller, less uncertain reward did not differ by choice set among those who faced a hedonic reward ( $\chi^2(1) = .94$ ,  $p = .33$ ), those who faced a cash incentive were more likely to select the smaller-certain reward contract when certainty was present as opposed to absent ( $\chi^2(1) = 3.46$ ,  $p = .06$ ).

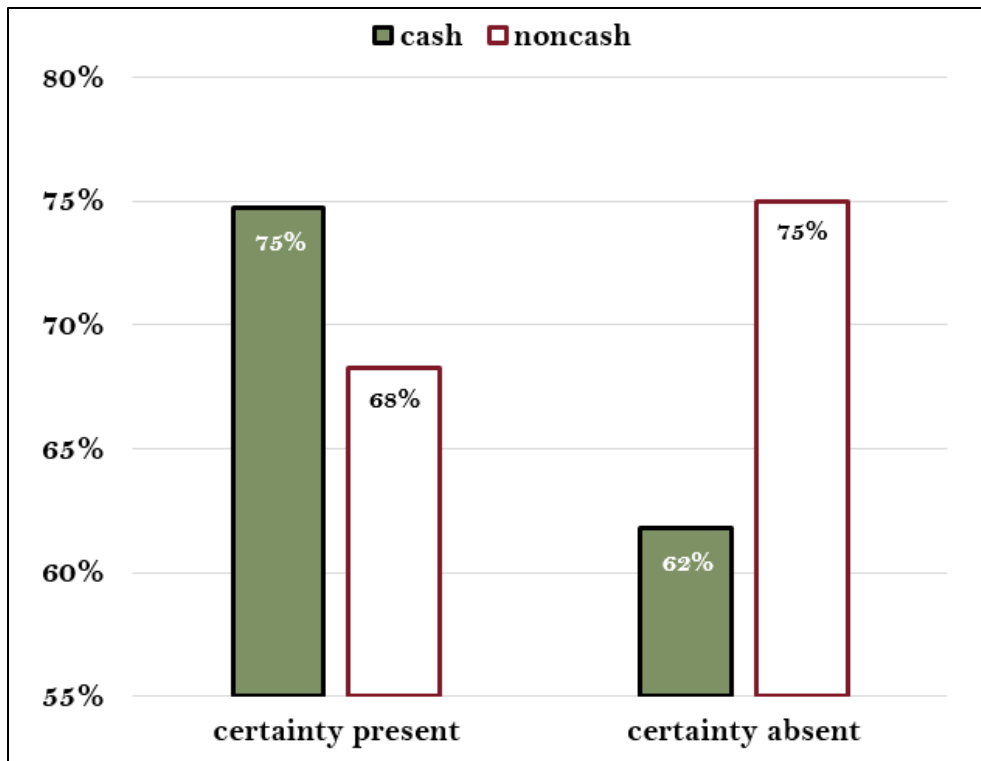


Figure 28: Choice share of exercise incentive program offering the smaller but less uncertain (over larger but more uncertain) reward (Study 5a).

Overall, the above pattern indicates that cash incentives are more likely to induce a preference for effort-contingent rewards that are assured (with 100% certainty) as opposed to rewards that merely have a relatively higher, but not certain, probability of being realized—even after the required effort has been expended. Such behavior is again consistent with a greater compensation focus—one that leads people to privilege rewards that are certain, but which prompts them to attempt to maximize expected returns when certainty becomes impossible.

### 3.9.2 Study 5b: Preference for Absolute Immediacy

I next tested, in Study 5b, whether a similar pattern would emerge for tradeoffs involving time. Here I predicted that when an immediate, contingent cash incentive is no longer available as an option,

people would be more likely to select the larger but more delayed reward in the interest of maximizing net present value.

*Method.* Participants were 348 respondents randomly assigned to one of four conditions in a 2 (incentive type: cash vs. noncash)  $\times$  2 (choice set: immediacy present vs. immediacy absent) between-subjects design. Following the scenario I described in Study 2a, I again asked participants to choose between two exercise incentive programs in their area, both of which offered a reward—denominated in either cash or hedonic currency—for walking at least 60,000 steps. I assigned half of the participants in each incentive type condition to one of two choice sets. In the “immediacy present” condition, people chose between a program with a smaller reward of \$20 (in either cash or hedonic currency) to be received *immediately*, and another program with a larger reward of \$30 (in either cash or hedonic currency) to be received in two months. Paralleling the design of Study 5a, those assigned to the “immediacy absent” condition read the same information except that the program offering the smaller reward also featured delay, albeit to a lesser degree (\$24 to be received in one month).<sup>35</sup>

*Results and discussion.* I found an analogous pattern to the risky choice when participants traded off between reward magnitude and delay. A binary logistic regression on choice share of the smaller but less delayed incentive revealed an incentive type  $\times$  choice set interaction ( $B = .93$ ,  $SE = .45$ ,  $\chi^2(1) = 4.24$ ,  $p = .039$ ), with no main effects of either factor (see Figure 29). Among those in the immediacy present condition, directionally more people exposed to the cash incentive (vs. noncash hedonic incentive) chose the program with the smaller-immediate reward (69%<sub>cash</sub> vs. 51%<sub>noncash</sub>;  $\chi^2(1) = 6.13$ ,  $p = .013$ ). When both incentives lacked complete immediacy, however, equally

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<sup>35</sup> Note that in both choice sets, the larger, more delayed reward offers a higher net present value than the smaller, less delayed reward assuming an empirically reasonable range of discount rates (e.g., indifference between \$20 now and \$30 in two months, and between \$24 in one month and \$30 in two months, implies annual exponential discount rates of 243% and 267%, respectively).



many participants in the cash and noncash incentive conditions chose the less delayed, smaller incentive (54% vs. 57%;  $\chi^2(1) = .18, p = .67$ ). While choice shares of the smaller, less delayed reward did not differ by choice set among those incentivized with the noncash reward ( $\chi^2(1) = .63, p = .43$ ), those incentivized with cash were more likely to select the smaller-immediate reward when immediacy was present as opposed to absent ( $\chi^2(1) = 4.60, p = .03$ ). Thus, when reward immediacy is impossible (*i.e.*, when both options are delayed), a greater compensation focus may induce individuals to be less willing to sacrifice a reward's magnitude for a comparatively smaller time delay.

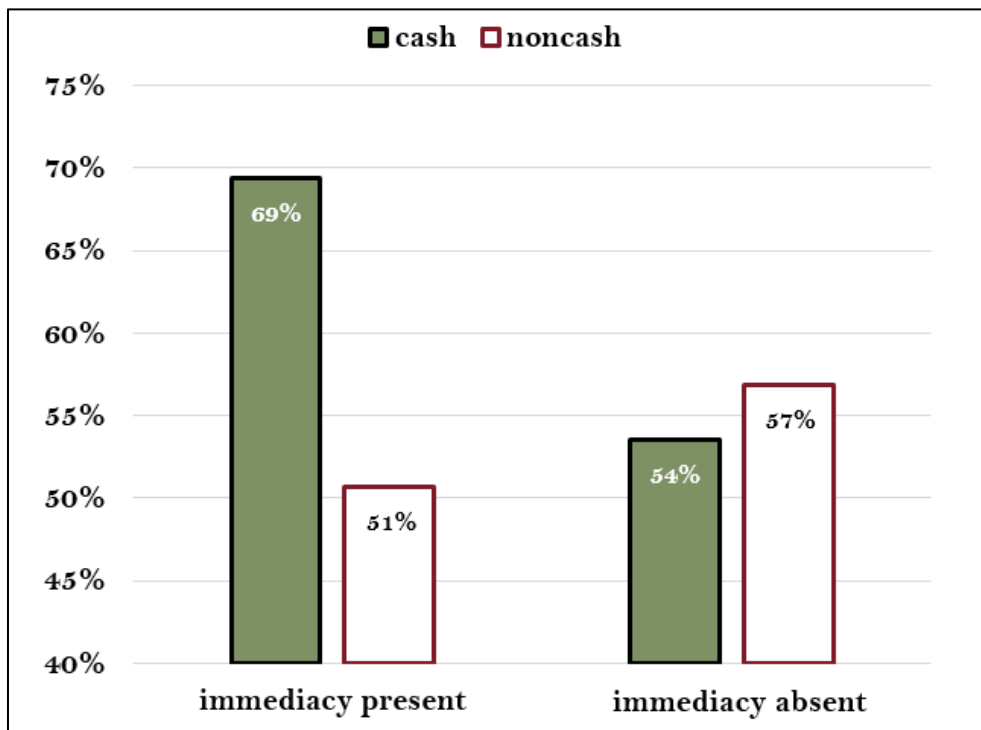


Figure 29: Choice share of exercise incentive program offering the smaller but less delayed (over larger but more delayed) reward (Study 5b).

To conclude, the data from Study Series 4 and 5 suggest that the effect of cash incentives on attraction to immediate or sure—yet smaller—rewards is less pronounced when the incentives (*i*) are not contingent on effort (Studies 4a and 4b) and (*ii*) are not attainable without accepting some level of risk or delay (Studies 5a and 5b). In this regard, monetary incentives may cause individuals to

assign a “premium” to options that promise *absolute* certainty and immediacy of a reward (at the cost of its expected, or net present, value). Such preferences provide additional evidence of a compensation focus elicited by cash incentives: When people need to work to earn a monetary award, they tend to privilege contracts that allow them to receive that prize with 100% certainty and with no delay.

### **3.10 Study Series 6: Cash Incentives Increase Cheating on Real-Effort Tasks**

#### 3.10.1 Compensation Focus and Cheating Behavior

The empirical evidence I have laid out so far implicate a compensation focus in the presence of cash incentives that affects tradeoffs involving risk and time. Specifically, incentivizing people with cash, compared to hedonic rewards with equivalent monetary value (and to unrewarded controls) appears to enhance their preference for guaranteed and immediate incentive systems. This attraction toward greater certainty and immediacy was, moreover, associated with lower effort streams, a relationship reflected in the marketplace: Higher performance thresholds and harder goals typically require more effort investment and entail riskier, more delayed incentives.

A separate but related question is whether greater compensation focus—the same force I posit as responsible for lowering people’s willingness to expend effort and tolerate risk and delay in reward attainment—can also influence behaviors during goal pursuit, such as the *integrity* characterizing individuals’ performance and effort investment. To the extent that cash incentives (and the compensation focus they evoke) lead people to care less about *how* a desired outcome is achieved (as the reported “outcome vs. process” focus measure in Study 3d attests), they may

similarly cause individuals to be tempted by shortcuts that guarantee and expedite payment: People may cheat more.

Recall that in Study 3b, participants who faced the prospect of earning a cash (vs. noncash hedonic) bonus for walking a self-determined number of steps per week were more likely to, in some sense, “game” the system by indicating excessively low weekly step counts that would guarantee them compensation (*e.g.*, below 1,000 or even 100 steps—unreasonable estimates barring extreme cases of sedentarism). Although these kinds of responses are not tantamount to cheating *per se*, they nevertheless hint at the possibility that monetary rewards can blunt people’s willingness to put forth an honest attempt that follows the spirit of the prescribed incentive scheme.

The corruptible effects of money on individuals’ ethical behavior has, indeed, some support in the money priming literature. For example, participants exposed to abundant wealth or the concept of money (*e.g.*, after seeing 7,000 dollar bills instead of 24 dollar bills) cheated more frequently (Gino and Pierce 2009; see also Gino and Mogilner 2014). In my studies, however, I focus on cheating behavior as a function of effort-contingent incentives rather than activating reminders of money in the symbolic sense. As Study Series 3 suggests, the effects of a greater compensation focus—as shown by a pronounced preference for guaranteed and immediate rewards—is likely to only manifest in the presence (rather than absence) of effort-reward contingency. Whereas prior work has largely contrasted money primes with either neutral primes, the absence of money (*e.g.*, scarcity), or other resources (*e.g.*, time), I assessed the differential effects of contingent cash incentives with noncash hedonic rewards (of equivalent monetary value), and with unrewarded controls, on cheating behavior.

In the next series of studies, I use real-effort tasks with real incentives to test the hypothesis that participants incentivized with cash will be willing to cheat more compared to those who faced

no incentives (*i.e.*, in a control condition) or those who faced hedonic rewards of equivalent monetary value.

### 3.10.2 Study 6a: Counting Zeros

*Method.* Study 6a assessed whether cash incentives, relative to noncash hedonic rewards, incite more cheating in an effort-contingent activity. I randomly assigned 279 participants to one of three incentive conditions (control vs. cash incentive vs. noncash incentive); the survey was ostensibly about “cognitive perceptions and processes” (see Appendix B4 for complete instructions and stimuli). In the control condition, participants received only a baseline fee of \$0.90 for completion. Those in the incentive treatments received the same fee but could also earn a bonus reward if they scored in the top 5% of all participants. The performance-contingent bonus consisted of either \$10 cash (in the cash incentive condition) or the participant’s choice of one hedonic item of equivalent retail value from a gift catalog (in the noncash incentive condition). Because I explicitly stated the monetary value of the hedonic reward, any difference that arises between the two performance-based incentive conditions is unlikely to be purely due to money priming.

All participants worked on a “counting zeros” task (adapted from Abeler et al. 2011) that involved counting the number of zeros appearing in a series of five tables (consisting of 15 rows  $\times$  29 columns) made up of randomly ordered 0s and 1s (see Figure 30). I allotted participants only 90 seconds to count each table.

How many zeros are in the table?

```

01000001101111011101110001110
10100111011000010000010011101
01110001110000110000010101101
01110101101110001101101111010
10000101010000111011010100110
11010101010101111010101100011
11110101001100101110111011111
10000101100101110110100101100
01110101100101101010001110100
01001110011101011010011110011
11100110001101011000101101100
0101101110101110111111000110
10110000110001000100010101100
10100100100001011100110110010
01110110100110001111001100001

```

# of zeros

Figure 30: Sample table in Counting Zeros task (Study 6a).

After entering their answer for each table, participants read that a new table would be randomly generated on the next page. This was done in the interest of task realism and to decrease any suspicion that the tables were “rigged” in any way. In actuality, all participants saw the same five tables.

Importantly, I cautioned them to “try to count the zeros using just your eyes instead of with the help of external tools like the *find in page* search command.” This last instruction drew participants’ attention to the possibility of cheating on the task, since the exact number of zeros in a given table could be easily obtained by either navigating to their browser menu and selecting “find in page” or by entering the “CTRL+F” command on their keyboard (which opens the same search function). Because the time limit I imposed rendered correct responses (*i.e.*, exact answers) highly unlikely without the aid of these shortcuts (an assumption I validated empirically), I interpreted higher performance scores on the task as evidence of greater cheating.

*Results and discussion.* For each participant, I calculated a score given by the total number of tables for which they “correctly” counted the number of zeros. I normalized this measure using a log transformation (the untransformed data yield similar results<sup>36</sup>). The average number of tables counted “correctly” varied by incentive condition ( $F(2,276) = 4.34, p = .01$ ; see Figure 31). Specifically, those in the cash incentive condition “cheated” more on this metric ( $M = 1.01$  [ $SD = 1.58$ ]) relative to those in the control condition ( $M = .53$  [ $1.21$ ];  $t(276) = 2.44, p = .015$ ) and relative to those in the noncash reward condition ( $M = .47$  [ $1.09$ ];  $t(276) = 2.62, p = .009$ ); there was no difference between the control and noncash reward groups in the average number of tables “correctly” counted ( $t(276) = -.09, p = .93$ ).

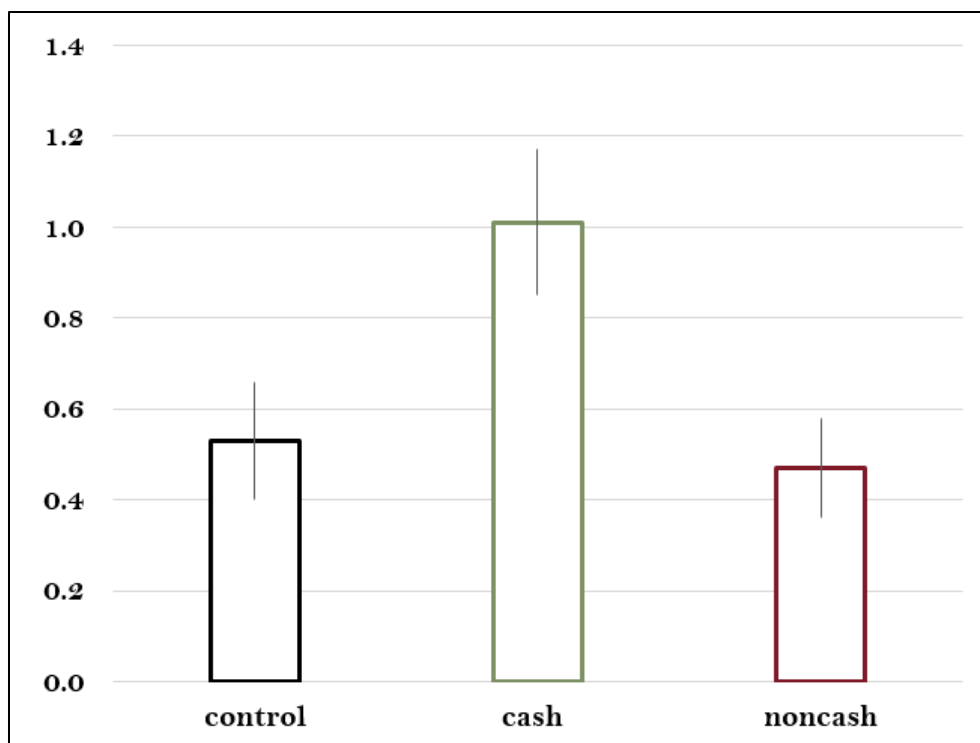


Figure 31: Number of tables (out of 5) counted exactly correctly (Study 6a). Error bars are standard errors ( $\pm 1$  SEM).

<sup>36</sup> A zero-inflated negative binomial regression (given the overdispersion of the outcome variable) produced consistent patterns.

Further, a greater proportion of participants provided the exact solution in the cash incentive condition relative to the control or noncash incentive conditions for each table (see Figure 32).

Although the absolute incidence of cheating was fairly low in the aggregate,<sup>37</sup> a consistently higher proportion of participants did so in the cash incentive condition compared to their counterparts in the control and noncash incentive conditions (table 1: 20%<sub>cash</sub> vs. 11%<sub>control</sub> vs. 6%<sub>noncash</sub>,  $\chi^2(2) = 8.13$ ,  $p = .017$ ; table 2: 8% vs. 1% vs. 5%,  $\chi^2(2) = 4.61$ ,  $p = .10$ ; table 3: 26% vs. 14% vs. 11%,  $\chi^2(2) = 6.75$ ,  $p = .034$ ; table 4: 24% vs. 12% vs. 10%,  $\chi^2(2) = 6.84$ ,  $p = .033$ ; table 5: 24% vs. 15% vs. 14%,  $\chi^2(2) = 3.00$ ,  $p = .22$ ).

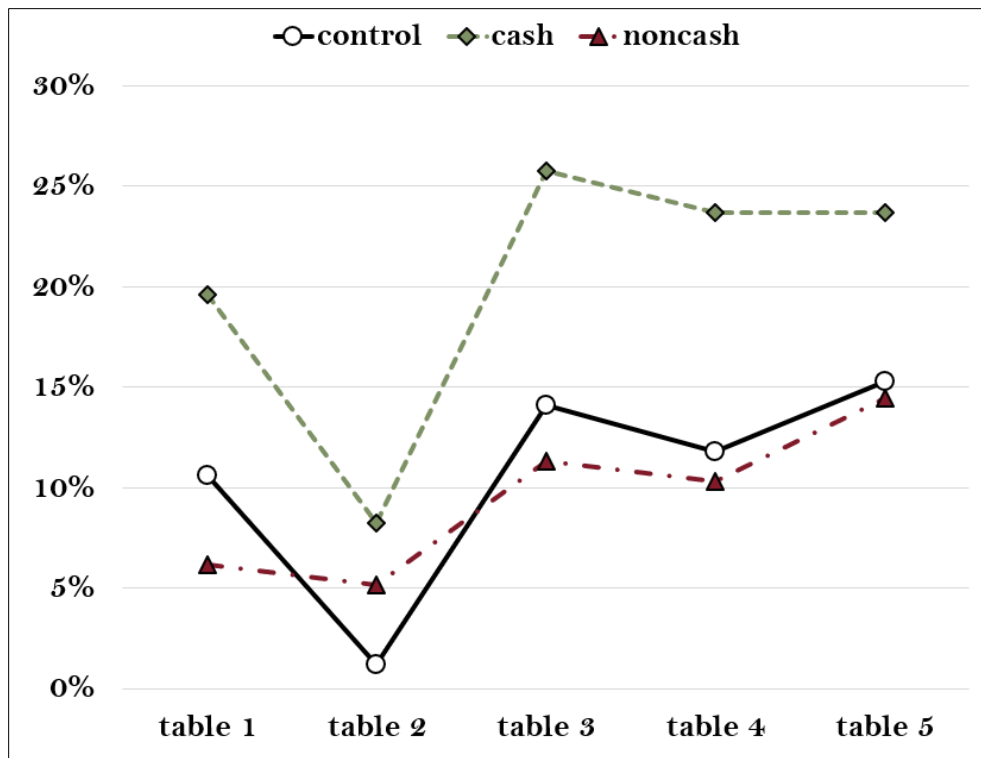


Figure 32: Percentage of participants who provided the exactly correct solution to each table (Study 6a).

<sup>37</sup> That most people did not cheat is perhaps not too surprising (and reassuring in some sense), given the explicit instructions to not use shortcuts.

A potential alternative explanation for the pattern above is that participants who could earn cash (compared to noncash rewards) were simply more motivated to do well on the task and genuinely performed better on the task. To address this concern, I conducted a posttest on a separate sample ( $N = 280$ ) using an identical procedure except that I removed the opportunity to cheat on the task. Specifically, cheating was rendered impossible because I presented each table to the participants as an image pasted on the screen that was not searchable using the “find in page” (or “CTRL+F” command) command. As a result, people could only “manually” count the number of zeros in each table (by visually inspecting the table, *i.e.*, actually investing effort without cheating). I imposed the same time limit of 90 seconds per table before the screen automatically advanced.

If cash incentives led people to cheat more and hence count more tables “correctly,” then when participants can no longer use any shortcuts to automatically detect the number of zeros in a table, performance should no longer be higher in the cash incentive condition compared to the unrewarded control or noncash incentive conditions. I tested this prediction and found no effect of incentive type or condition on the number of tables counted (exactly) correctly ( $F(2,277) = .41, p = .66$ ). Figure 33 illustrates these results in conjunction with those obtained in Study 6a (when cheating was possible).



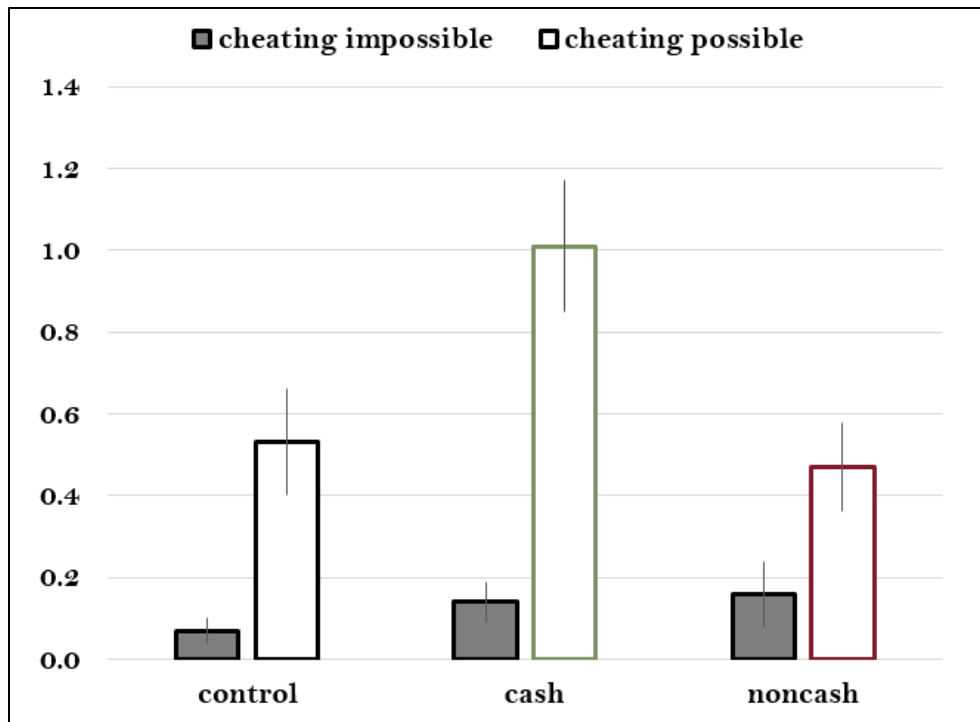


Figure 33: Number of tables (out of 5) counted exactly correctly when cheating was impossible compared to possible (Study 6a). Error bars are standard errors ( $\pm 1$  SEM).

As I anticipated, those in the cash incentive condition gave equally few correct solutions ( $M = .14$  [ $SD = .47$ ]) as did those in the control condition ( $M = .07$  [.25]) or in the noncash reward condition ( $M = .16$  [.76]), suggesting that the participants in Study 6a were indeed more likely to cheat on the counting zeros task under the provision of cash incentives (vs. no incentives or noncash hedonic rewards). Note that the averages I observed in the posttest are lower compared to those in each of the corresponding incentive conditions in Study 6a, indicating that participants there likely cheated across the board when the opportunity to do so was present.

### 3.10.3 Study 6b: Solving Anagrams

Study 6a contributes initial evidence that cash incentives can increase cheating behavior relative to noncash, hedonic rewards of the same retail value and to no-incentive controls. In Study 6b, I tested

whether this finding would emerge in a different paradigm that measured dishonesty. Specifically, I adapted an anagram task from Wiltermuth (2011), which allows participants the opportunity to cheat by falsely over-reporting their performance to increase their chances of receiving a contingent incentive. I again predicted that presenting individuals with cash incentives (compared to no incentives or noncash hedonic rewards) would increase the frequency of cheating due to invoking in people's minds a greater preoccupation with securing monetary gain.

*Method.* I randomly assigned 176 participants to one of three incentive conditions: a no-incentive control, a cash incentive condition, and a noncash (hedonic) incentive condition. Participants read that they would complete a task related to cognitive perceptions; those in the cash as well as noncash incentive groups further learned that they would have the chance to receive an additional bonus reward depending on their performance (see Appendix B5 for stimuli).

Next, I directed all participants to a page with instructions for an “Unscrambling Words” puzzle that tasked them with unscrambling a series of jumbled words (*i.e.*, anagrams) on a page in a given amount of time. (I defined “unscrambling” here to mean rearranging the letters such that the resulting word forms a valid English word containing all the letters of the original scrambled word.) The instructions specified the same scoring mechanism whereby they would earn 10 points for each anagram they report successfully solving *in order from the beginning*. Adopting the language used in Wiltermuth (2011), I emphasized this order aspect: “This means you should try to solve the jumbles in the order they appear. So, for example, if you successfully unscramble the first 3 word jumbles but not the 4th, you will earn points only for the first 3—even if you also successfully unscramble the 5th, 6th, and 7th word jumbles.” I also added a cautionary note to “use only your mind, and no other tools, to solve the jumbles.” Participants assigned to the two incentive conditions additionally read information about the bonus reward, which they would earn if their total score fell within the top 5% of participants. In the cash incentive condition, this reward consisted of \$30 in cash; in the

noncash incentive condition, it consisted of the participant's choice of one hedonic item (worth \$30) from the gift catalog used in previous studies.

I presented nine anagrams on a single page. For each anagram, participants indicated whether they successfully unscrambled that anagram by checking either a "Not Solved" or "Solved" button. To remove any perception of external monitoring by the researcher, I did not ask them to write their solutions at any point. A timer appeared at the bottom of the page that counted down from 420 seconds (seven minutes), after which the page automatically advanced. Of the nine anagrams, eight could be unscrambled without excessive mental effort to form fairly common words such as "house" and "jumping." However, the third anagram ("UNAAGT") could only be solved to spell *taguan*, an obscure word for an Asiatic species of flying squirrel. Previous pretesting conducted by Wiltermuth (2011) confirmed that correctly identifying this solution is exceedingly unlikely, with not a single participant able to successfully unscramble the "UNAAGT" jumble in the original study. Further, while it is conceivable that people could turn to online anagram solvers despite our instructions, I found no programs that returned *taguan* as a solution. Participants could therefore "cheat" by falsely reporting that they had solved this third anagram; doing so would allow them to considerably increase their total score (and hence improve their chances of winning the incentive for those assigned to either of the two incentive conditions) by earning credit for the subsequent six anagrams. Therefore, I examined the frequency with which participants reported successfully solving the third practically-impossible ("UNAAGT") anagram as the primary dependent measure.

*Results and discussion.* The incidence of cheating was relatively high in the aggregate, with 63% of participants reporting having solved the third "impossible" anagram. However, a binary logistic regression revealed that the frequency of cheating varied across incentive condition ( $\chi^2(2) = 13.64$ ,  $p = .001$ ), with 79%, 62%, and 45% of participants in the cash incentive, noncash incentive, and control conditions, respectively, indicating that they successfully solved the third anagram (see

Figure 34). Those in the cash incentive condition cheated more on this metric than those in the noncash incentive condition ( $p = .029$ ) and more than those in the control ( $p < .001$ ); participants in the noncash incentive group in turn cheated directionally more than those in the control ( $p = .08$ ).

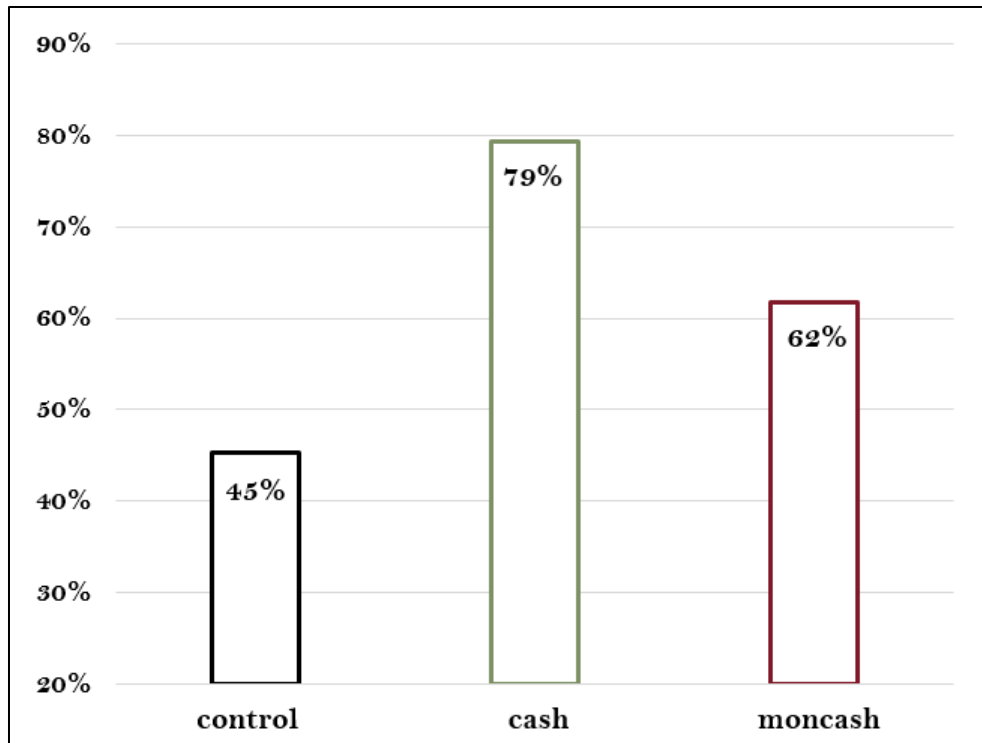


Figure 34. Percentage of participants who reported solving the third (“impossible”) anagram (Study 6b).

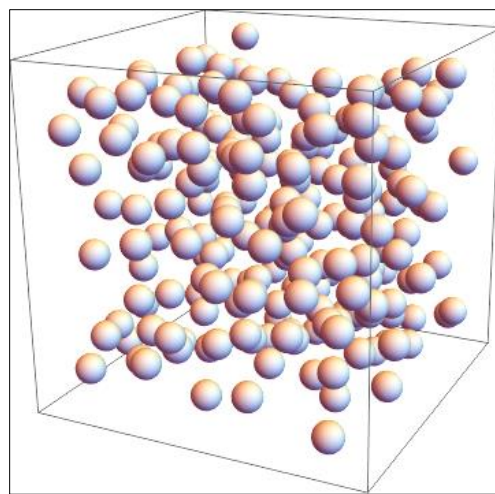
To summarize, although the incentive to act dishonestly overall was present for all participants given the lack of external monitoring, it appears that the incidence of cheating was most pronounced among those who could attain compensation that was denominated in cash.

#### 3.10.4 Study 6c: Guessing Marbles

To further test the replicability of the previous results, in Study 6c I looked at a similar metric—degree of overreporting one’s performance—using a third, novel paradigm that I devised to measure cheating behavior.

*Method.* Participants consisted of 321 respondents, randomly assigned to one of three incentive conditions (no-incentive control vs. cash incentive vs. noncash incentive). I asked participants to complete an online survey ostensibly about how people “visually perceive objects”; I further told them that to help researchers test this cognitive process, they would be playing a “marble guessing game” that involves estimating how many marbles appear in a series of cubes, or “boxes.”

Specifically, participants read that they would see a series of five boxes, each with a “randomly generated number of marbles (represented by colored spheres) inside,” and that their task is to estimate the number of marbles in each box. (In actuality, I presented everyone with the same stimuli; see Figure 35 for a sample problem.) Participants learned that they would have 15 seconds to examine each box and type their answer before the screen automatically advanced. I displayed a timer counting down from 15 seconds on each page. Further, I informed participants that they will be given feedback on the accuracy of their responses for each box (*i.e.*, their own guess and the correct answer), and to therefore “make sure to take notes somewhere separately in order to keep track of how many points you scored (if any) based on that feedback.”



*Figure 35:* A sample box of marbles in the Guessing Marbles task (Study 6c).

All participants read that their score would be determined by how many points they receive for each box, according to the following distribution: Each *exactly* correct answer (*i.e.*, if they guess the exact number of marbles depicted) would give them 20 points; each answer within 10, 20, and 30 marbles from the actual number depicted would give them 10 points, 5 points, and 1 point, respectively; and all other responses would award no points. I included two questions about the scoring system as a comprehension check.

After reading the instructions, participants assigned to the control condition proceeded to the focal task (for which they received a baseline fee of \$0.80, regardless of their performance). Those assigned to each of the other two conditions read that they had the opportunity to earn a reward (on top of the baseline participation fee of \$0.80) depending on their performance on the marble guessing game—specifically, if they scored within the top 10% of all participants in the study. In the cash incentive condition, this incentive consisted of \$10 in cash, while in the noncash incentive condition it consisted of the participant’s choice of one item (with retail value of \$10) from a similar hedonic gift catalog used in previous studies. Those in the noncash incentive group chose one item from the catalog as their preferred reward.

How could participants cheat? I gave them the opportunity to misreport their performance toward the end of the survey. Specifically, after they completed the marble guessing game, all participants saw a “final score calculation” page displaying their guesses for each of the five boxes, along with a reminder of the scoring rules (*i.e.*, how many points they would gain if their estimate fell within 0, 10, 20, and 30 marbles from the true answer). As the primary dependent measure, I asked participants to state directly how many points they earned for each box. That is, participants read that “since the actual correct answers to the specific boxes you saw were not recorded as part of this survey for technical reasons,” they should fill out the table with their points scored to the best of their recollection as they kept track during the task (*i.e.*, based on the feedback given). In the cash

and noncash incentive conditions, I emphasized to participants that whether they earn the incentive (\$10 cash or their selected hedonic prize of equivalent retail value, respectively) will depend on the total score calculated based on their self-reported points.

Note that I designed the task to be sufficiently challenging given the time constraint (only 15 seconds allotted per estimate) and large number of marbles depicted (167, 97, 221, 182, and 288 marbles in the boxes, in each of the five boxes, respectively). Compounded with the visual clutter of the boxes (*i.e.*, marbles overlapped with each other to make counting each one very difficult), the design of the task ensured that identifying the exact number of marbles in any given box would be exceedingly unlikely. A well-educated guess could, however, fall within wider margins of error, such as the 10, 20, or 30 marbles range; less precise estimates would in turn offer diminishing returns (*i.e.*, fewer points which in turn translate to a lower chance of scoring in the top 10% of participants).

Unbeknownst to participants, I kept a record of each individual's responses relative to the correct solution. This allowed me to objectively measure cheating as given by the amount of points reported over and above the true score. Finally, participants completed basic demographic questions; those in the two incentive conditions (cash and noncash) who scored in the 90th percentile (top 10%) subsequently received the relevant incentive.

*Results and discussion.* I report results for the untransformed data (a nonparametric analysis yielded similar results). Participant's actual scores did not differ significantly across the three conditions ( $M_{\text{control}} = 3.16$  [ $SD_{\text{control}} = 4.46$ ];  $M_{\text{cash}} = 5.22$  [11.53];  $M_{\text{noncash}} = 3.21$  [4.57];  $F(2,318) = .98$ ,  $p = .38$ ), indicating that participants performed equally poorly across the three conditions. For each participant, I computed a deviation measure by subtracting that participant's total *true* score—*i.e.*, points accumulated across the five rounds—from the total number of points that they *reported* for themselves. A positive deviation score, therefore, indicates the likely presence of cheating (*i.e.*,

overreporting one's own performance), with higher positive scores indicating a greater magnitude of cheating.

The total amount of points overreported across the five boxes—that is, the amount of cheating—varied by incentive group ( $M_{\text{control}} = 9.70$  [18.23];  $M_{\text{cash}} = 16.98$  [28.75];  $M_{\text{noncash}} = 11.14$  [23.07];  $F(2,318) = 2.88, p = .058$ ). In particular, a planned contrast revealed that participants assigned to the cash incentive condition overreported more total points than did those assigned to the control ( $t(318) = 2.27, p = .024$ ) and (albeit less so) those assigned to the noncash reward condition ( $t(318) = 1.79, p = .075$ ), which did not differ between each other ( $t(318) = .44, p = .66$ ). Participants who faced cash incentives hence “cheated” more compared to those in the other two incentive conditions combined ( $t(318) = 2.35, p = .019$ ).

However, the above pattern of results appeared to be driven primarily by a greater magnitude of cheating conditional on having cheated at all (*i.e.*, on the intensive margin) rather than a greater incidence of having cheating at all. Decomposing this effect, I coded each participant's responses according to whether the participant overreported his/her score by any positive amount for a given box. As shown in Figure 36, the proportion of participants who cheated at all did not differ by condition for any box (box 1:  $\chi^2(2) = 3.78, p = .15$ ; box 2:  $\chi^2(2) = 2.85, p = .24$ ; box 3:  $\chi^2(2) = 1.26, p = .53$ ; box 4:  $\chi^2(2) = 1.85, p = .40$ ; box 5:  $\chi^2(2) = 2.68, p = .26$ ), nor did it differ in a repeated-measures analysis across all five boxes.



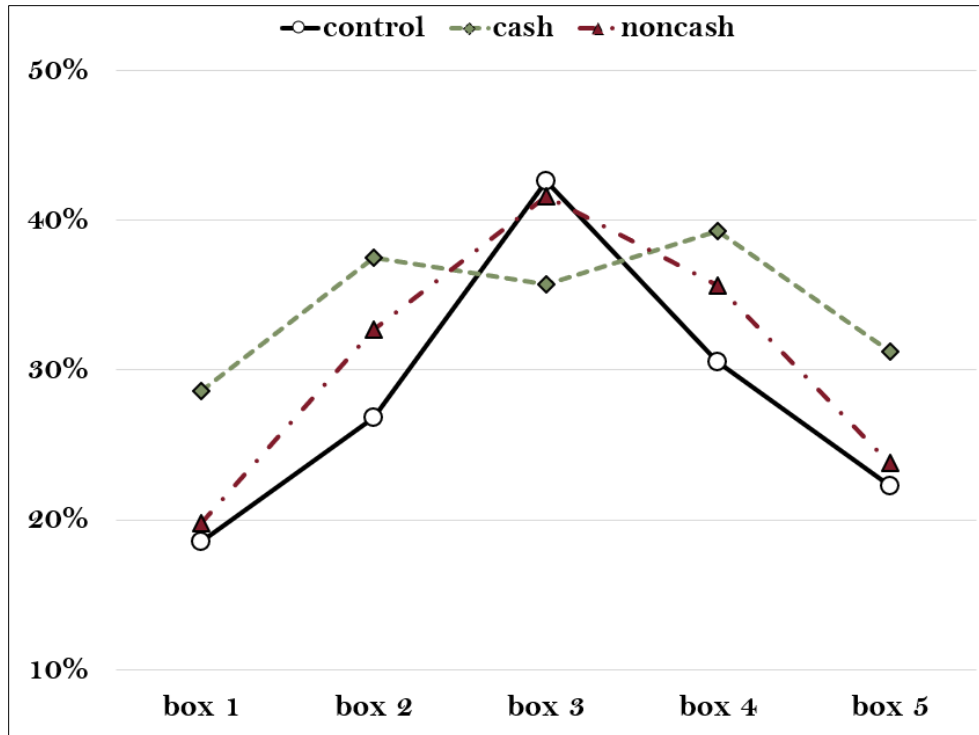


Figure 36: Percentage of participants who overreported any points at all (Study 6c).

The total amount of points overreported *conditional* on having overreported at all varied by incentive group ( $M_{\text{control}} = 15.67$  [ $SD_{\text{control}} = 20.12$ ];  $M_{\text{cash}} = 28.01$  [ $31.72$ ];  $M_{\text{noncash}} = 17.33$  [ $25.52$ ];  $F(2,209) = 4.62, p = .01$ ; see Figure 37). Specifically, participants randomly assigned to the cash incentive condition overreported their points by a higher margin compared to those assigned to the control condition ( $t(209) = 2.81, p = .005$ ) and to the noncash reward condition ( $t(209) = 2.42, p = .017$ ), which did not differ from each other ( $t(209) = .38, p = .71$ ). Again, participants who faced cash incentives “cheated” more compared to those in the other two incentive conditions combined ( $t(209) = 3.01, p = .003$ ).

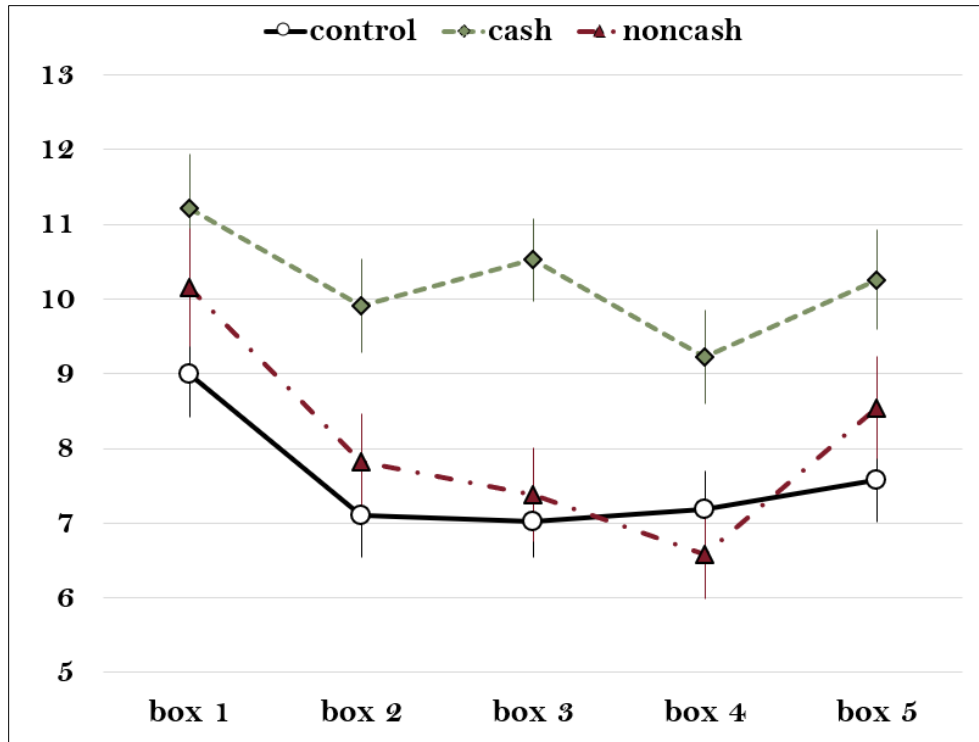


Figure 37: Average number of points overreported conditional on having overreported at all (Study 6c). Error bars are standard errors ( $\pm 1$  SEM).

Finally, as an approximate baseline measure of noise that partially captures the extent to which people may have forgotten or misjudged their true performance, I calculated for each individual whether s/he underreported his/her scores. The proportion of participants who underreported their scores remained low for each box overall and did not vary as a function of incentive condition (box 1: 2%<sub>control</sub> vs. 0%<sub>cash</sub> vs. 0%<sub>noncash</sub>; box 2: 0% vs. 2% vs. 2%; box 3: 4% vs. 3% vs. 5%; box 4: 11% vs. 10% vs. 12%; box 5: 3% vs. 1% vs. 1%; all  $p$ s > .1).

All in all, the above findings impart additional evidence for the hypothesis that cash incentives, relative to noncash hedonic rewards or a no-incentive control condition, incite greater cheating. In this respect, a heightened compensation focus may lead people to privilege attaining cash above ethical concerns involved in how that cash is earned.

### 3.10.5 Study Series 6: Discussion

The convergent pattern of results across the three studies I have described in this section suggests that performance-contingent cash incentives (relative to noncash hedonic rewards and to no-incentive controls) can indeed lead to disincentivizing effects in the form of increased cheating. Ultimately, I argue that such behavior falls in line with the symptoms of greater compensation focus, one that places the ends (*i.e.*, attaining a cash incentive) above the means (*i.e.*, integrity in the process of attaining the prize).

### **3.11 Study 7: People Prefer Cash Incentives and Think They Are More Motivating**

In Study Series 1 through 5, I demonstrated that relative to noncash hedonic rewards of equivalent retail value (and relative to unrewarded controls), cash incentives tend to increase preferences for alternatives that offer smaller but certain, immediate, and easy to obtain rewards (over larger but probabilistic, delayed, and hard to obtain rewards). Study Series 6 further shows that cash incentives can cause people to cheat more in the course of goal pursuit (*i.e.*, completing a focal task or activity). These findings together highlight the deleterious effects of monetary incentives on individuals' motivation and performance.

When facing a direct choice between cash and noncash rewards, however, which incentive system would most people prefer? What kind of compensation scheme would they predict to be more motivating? To test this, I presented people with two incentive programs that offered a reward of equivalent expected value but denominated in different currencies (cash vs. hedonic). In line with previous research that suggests the dominance of monetary over nonmonetary incentives in individuals' stated preferences (*e.g.*, Jeffrey 2009; Kivetz and Simonson 2002b), I similarly expected that reward programs offering cash-based performance incentives (vs. hedonic rewards of equivalent

retail value) would generate more lay appeal, both in terms of enrollment preferences and perceived motivational force.

*Method.* I randomly assigned 339 participants to one of two “presence of certainty” conditions (either “both options certain” or “both options uncertain”). Following the procedure used in the risky choice study series, I asked people to consider the same exercise scenario where they could choose between two reward programs (presentation order counterbalanced). Both programs lasted one month (four weeks) and awarded a weekly bonus for members who walked at least 60,000 steps each week.

Rather than varying the incentive type (cash vs. noncash) between-subjects as I did in Study Series 1-5, here I directly juxtaposed the two currencies for each individual. Participants randomly assigned to the “both options certain” condition faced a choice between Program A, which awarded members who met the step goal with \$5 in cash, and Program B, which awarded them with their choice of a hedonic reward (with retail value of \$5) from the gift catalog used in previous studies. By contrast, participants in the “both options uncertain” condition chose between Program A, which offered eligible members a 1 in 20 chance of earning \$100 in cash, and Program B, which offered them a 1 in 20 chance of earning their choice of a hedonic reward (with retail value of \$100). After choosing the program they preferred to join, participants indicated: (i) which of the two programs they would prefer to join, one that offered cash incentives or another that offered hedonic rewards; and (ii) which incentive program they believe would motivate them to expend more effort and walk more steps.

*Results and discussion.* Examining first the responses to the enrollment preference measure, I found that participants were more likely to choose the cash incentive program when it was listed first compared to second (86% vs. 78%;  $\chi^2(1) = 3.89, p = .049$ ), although presentation order did not interact with the “presence of certainty” factor to affect choice shares ( $\chi^2(1) = .25, p = .62$ ). The

chosen incentive program also did not vary based on presence of certainty: 80% and 85% of participants in the “both options certain” and “both options uncertain” groups, respectively, chose the cash over the noncash incentive program ( $\chi^2(1) = 1.74, p = .19$ ). Notably, the vast majority preferred to join the program offering the cash incentive rather than the hedonic reward, with 83% selecting the former over the latter ( $\chi^2(1) = 146.69, p < .001$ ).

Presentation order did not affect responses on the perceived motivation measure ( $\chi^2(1) = 2.64, p = .10$ ), although participants were slightly more likely to select the cash incentive program as the more motivating of the two when it was listed first (85%) rather than second (80%). Whether the incentives were presented in certain or probabilistic terms did not affect choice shares of the program offering the cash incentive as the more motivating program: 81% and 85% of participants in the “both options certain” and “both options uncertain” groups, respectively, indicated the cash-based program as more motivating ( $\chi^2(1) = 1.74, p = .19$ ), nor did condition interact with presentation order to affect choice shares on this measure ( $\chi^2(1) = .013, p = .91$ ). Paralleling the responses for enrollment preference, people were considerably more likely to identify the cash incentive program as more motivating than the noncash incentive program, with 83% favoring the former ( $\chi^2(1) = 149.34, p < .001$ ).

Yet, these stated preferences do not completely align with the choices observed in Study Series 1, where incentivizing people with cash led them to select “safer” alternatives with an easier-to-achieve goal but lower payoff (Study 3a), to explicitly set lower performance thresholds (Studies 3b and 3b), and to opt for easy over challenging tasks (Study 3d). People’s stated preferences in Study 7 are similarly inconsistent with the choices observed in Study Series 2, where cash incentives led participants to select immediate but smaller (over delayed but larger) rewards. Finally, individuals’ lay beliefs about the motivating power of cash incentives are at odds with their revealed behaviors, as evidenced by the greater frequency of cheating and dishonesty in Study Series 6. Cash incentives,

in this regard, give rise to a “say versus do gap”: People’s stated preferences and beliefs overwhelmingly favor cash, but their actual behaviors suggest that cash instead tends to impede effort investment, goal aspiration, and task integrity.

### **3.12 General Discussion**

#### 3.12.1 Summary and Implications

Cash incentives are used everywhere in the marketplace to motivate customers, employees, salespeople, and managers. While money certainly has its benefits in terms of its superior fungibility, flexibility, and lay appeal, we know less about the psychological influences and consequences of cash incentives in direct comparison to other types of common rewards (*e.g.*, hedonic items and experiences).

The current research investigates how cash incentives—and the compensation-centric mode of reasoning they instill—shape people’s preferences, choices, and behaviors. The findings I have presented demonstrate that contingent cash incentives, relative to hedonic rewards of equivalent monetary value, may shift preferences toward alternatives that maximize how likely, as well as how soon, one’s earnings are received (while sacrificing reward magnitude and higher goal achievement). The preference for guaranteed or immediate rewards over uncertain or delayed ones (Study Series 1-2) reflects an overall attraction to alternatives that afford a safer payoff route. However, the tendency to select smaller but certain or immediate monetary compensation schemes appears to be attenuated when (*i*) the reward no longer depends on meeting an effort threshold (Study Series 4), and (*ii*) both rewards are probabilistic or delayed (Study Series 5). In the context of hypothetical scenarios as well as consequential tasks with real rewards, incentives denominated in cash

consistently led individuals to specify lower performance goals and effort thresholds, as well as to choose easier over difficult activities (Study Series 3).

Offering people cash incentives, as opposed to hedonic rewards or no incentive at all, also led them to cheat more on a number of tasks in the interest of helping them attain compensation for their efforts (Study Series 6). Finally, despite the selection of safer and easier alternatives when incentivized with cash (as opposed to with hedonic rewards), when given a direct choice between the two incentive types, people overwhelmingly preferred cash and believed it to be more motivating (Study 7).

Conceptually, this research program attempts to understand the compensation-centric motive induced by monetary incentives, the varied motivational consequences it engenders, and the factors that drive when it is more likely to prevail. Designing and enacting more personally motivating incentive systems presents an opportunity for marketers and policymakers who wish to improve the decisions and behaviors of their constituents.

### 3.12.2 Limitations and Extensions

The questions we have probed in this chapter open a variety of interesting (I believe) avenues of future research. It would be useful to further test the mediating role of compensation focus in shaping people's attraction to certain, easier, and immediate rewards. While Study 3d suggests that individuals who face monetary incentives (vs. no incentives or noncash hedonic rewards) do report attending more to the outcome of receiving the contingent reward as opposed to the process of earning it, direct evidence of what I call compensation focus (or "mindset") may also be discerned in other, perhaps subtler, ways. One source of information, for example, could consist in people's intuitive reactions to contracts offering different incentives. With the aid of text analysis tools to

code participants' open-ended reasoning, I would expect to see a more singular focus on concepts related to certainty, immediacy, and compensation for those facing cash (relative to noncash) rewards. Further, holding the amount of effort constant, cash incentives should induce people to place greater weight on feasibility concerns ("Can I earn the bonus at all?") over desirability ones ("How much can I earn?").

Another prediction that merits testing is whether there exists an expectation of a one-to-one relationship between effort and outcome among those incentivized with cash. When money enters the equation, I expect that people will tend to find contracts and activities acceptable only when the amount of possible earnings is proportional to the amount of effort they must expend. Relatedly, tasks in which effort is perceived to outweigh the reward's magnitude should be evaluated as more aversive, and met with greater reactance, by these same individuals. An analysis of lay perceptions and preferences surrounding tiered loyalty programs (*i.e.*, ones that feature a different distribution of effort-reward ratios) would be illuminating in this regard. Ultimately, I predict that information which pertains to the relative comparison between input (effort) and output (incentive) is likely to command greater attention and consideration when cash incentives, as opposed to noncash rewards, are at stake.

I envision several empirical extensions that would be useful to develop in regard to improving individuals' performance and cheating behavior. First, continuing to compare cash incentives to noncash rewards in the context of other cheating paradigms would be useful to test the robustness and generalizability of the effects I have so far observed. Second, the findings pertaining to cheating behaviors echo a broader notion of "taking the easy way out." The idea that cash incentives increase the tendency to settle for less ambitious goals calls for further work to identify real-world situations and domains in which people may be tempted to cut corners or take advantage of loopholes (*i.e.*, opportunities to cheat). For example, individuals who face cash incentives might



stop persisting in their goal(s) as soon as they encounter a license to give up. Once endowed with monetary compensation immediately or midway through the effort stream—and therefore having satisfied the desire to be rewarded—, people may be less inclined to work hard or finish the task in good faith.

In the interest of generalization, the present research would benefit from expanding the sample pool to other, perhaps more “specialized,” populations such as salespeople, employees, and managers. On a similar note, I have limited the study of noncash incentives in this chapter to tangible hedonic rewards as a juxtaposition against cash because (i) such rewards are prevalent and commonly employed in industry, and (ii) they afford a fairly conservative control, as they are not only similarly extrinsic as cash incentives but are explicitly equated in retail value. Nevertheless, many other forms of noncash incentives exist, including social incentives (*e.g.*, Bandiera, Barankay, and Rasul 2010) and ones that bear on image motivation and reputational concerns (*e.g.*, Ariely, Bracha, and Meier 2009). More investigation is needed to disentangle the efficacy of these alternative motives relative to cash and similarly extrinsic hedonic rewards. A final (though by no means exhaustive) question that I believe merits closer inquiry is whether employing negative reinforcement (*e.g.*, inducing penalties or framing incentives as losses rather than gains) will lead to similar choices and behaviors.

### 3.12.3 Conclusion

The current investigation raises some concerns about the ubiquitous practice of using cash or monetary incentives to drive desired behaviors. Across several studies encompassing hypothetical choices and real behavior, I found that cash “*disincentives*” seem to evoke a compensation focus that attracts people toward the outcome of attaining an incentive at the expense of truly engaging in

the effortful task at hand. Consequently, this fixation can blunt willingness to take risks or tolerate delay, stymie motivation to set higher goals or work on more challenging tasks, and even induce more cheating.

Although choosing the “path of least resistance” is a strategy likely to secure sufficient (*i.e.*, both desired and immediate) returns, doing so can at times work to the detriment of individuals and society in the long run. The findings outlined herein suggest, perhaps, that when people perform or pursue work with a focus on compensation (rather than infusing meaning into the work itself), they may end up avoiding risk or delay with respect to earnings, choose less ambitious goals, settle for safer career paths, and, in extreme cases, resort to less ethical conduct to ensure the payment they “deserve.” Deepening our understanding of when and why cash incentives fail—and how nonmonetary rewards can better motivate behavior—poses an important challenge for researchers and practitioners, with widespread implications for human welfare.

## CHAPTER 4

### CONCLUSION

Designing cost-effective incentives to motivate desired behaviors and healthy habits is a central area of interest for academics, executives, and policymakers. To the extent that incentives are employed as a tool for behavior change, the prevailing practice has been to study and rely on monetary rewards to alter decision making and performance. This dissertation furnishes some evidence that other incentive systems structured around noncash rewards (such as self-rewards or tangible hedonic prizes) may lead to less motivational crowding out and more meaningful improvement over the course of goal pursuit. In this chapter, I summarize and integrate the main findings from the previous two chapters. Extrapolating on these points, I conclude with a few comments and meditations on what the emergence of different incentive regimens might mean, at a more abstract level, for human progress.

#### **4.1 Review of Key Findings**

The sequence of results I have chronicled in this dissertation suggests that the provision of cash, relative to noncash, incentives can, in several instances, lead to suboptimal behaviors when people engage in effortful activities. This is not to say (nor would I claim) that cash is always disadvantageous; if anything, the results of the field experiments in Chapter 2 show that people can indeed, in the face of monetary incentives, be spurred to meet goals and thresholds at impressively high rates—as long as doing so nets them the prize. However, they may compromise other aspects of goal pursuit in the interest of attaining their reward, such as the willingness to exert effort above

and beyond what is minimally required or the resolve to engage in a task without compromising integrity. Thus, in circumstances where compensation is tied to a performance objective,<sup>38</sup> looking solely at outcomes like goal achievement when gauging the success of an incentive program can cause us to overlook its distortionary effects in other relevant (and arguably more important) aspects.

To reiterate the conclusions of Chapter 2, I described three field experiments, each lasting over two months, where I implemented a novel incentive mechanism based on self-reward—people treating themselves to indulgent rewards of their own definition whenever they meet a goal. I then monitored the influence of this system on both performance and task engagement over time. Self-rewards, I discovered, not only generated the same amount of lift—and at zero cost—compared to cash-based programs during the incentive period, but it also led to continued improvements in behavior for several weeks afterward. Individuals assigned to partake in a self-reward incentive contract continued to walk more and visit the gym during the post-incentive period more than their counterparts who had faced monetary incentives. I hypothesized that these patterns emerged in large part due to the treatment of cash incentives as “compensation” (*i.e.*, an entitlement or due payment for investing effort)—an association likely to be more threatening to intrinsic motivation—as opposed to simply a “reward” (*i.e.*, an indulgence for good behavior)

Chapter 3 builds on this compensation-reward distinction to focus on specific ways that cash incentives in particular can affect choice, effort, and integrity. There, I argued that the peculiarities we saw surrounding cash-incentivized participants in the field experiments—*e.g.*, the tendency to cluster around the goal and to procrastinate reaching it—speaks to a broader psychology underlying monetary incentives. The nature of this psychology, I further proposed, can be characterized by one

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<sup>38</sup> Rather than pure effort investment, which can be difficult to incentivize in many real-world settings (*e.g.*, in the workforce, people are generally not paid for how hard they try but how much work.

of greater compensation focus, wherein individuals become drawn to the outcome of securing a reward as opposed to the intrinsic motivation to engage in the focal activity itself. Thus, in addition to chasing payment in return for walking and going to the gym, when I presented individuals with a variety of choices and tasks for which they could earn cash (vs. noncash hedonic items), they displayed behaviors consistent with desiring compensation: People preferred small but sure bets to riskier ones with greater expected value; they opted to work on easier tasks for a smaller reward to ensure they leave with something rather than empty-handed; and they cheated more frequently when they had the chance.

Both Chapters 2 and 3, therefore, implicate compensation focus in the realization of individuals' preferences and behaviors. The tendrils of this heightened fixation on being compensated—a “show me the money” mindset, as it were—are felt in each quadrant of behavior pertaining to goal pursuit that we have scrutinized thus far. I summarize these, in brief, below:

*Habit formation.* Compared to individuals enrolled in the self-reward program, those incentivized with cash were more likely overall (compared to those incentivized with self-rewards) to meet the minimum goals required that would earn them the bonus. However, consistent with greater crowding out of intrinsic motivation, these same participants performed worse in terms of meaningful engagement in the focal activity (*i.e.*, walking more steps, going to the gym more times, and staying at the gym for longer periods) as well as persistence over time (*i.e.*, maintaining progress after the intervention is over).

*Choice of reward contract.* When asked to choose between incentive contracts where they must tradeoff the magnitude of a reward with its risk or delay, people preferred smaller but certain and immediate rewards (over larger but uncertain or delayed ones) when these incentives were denominated in cash (vs. a noncash, hedonic currency). These tendencies diminished when

compensation was no longer contingent on effort expenditure and when the possibility of complete certainty or immediate was precluded.

*Goal setting.* Similarly, when they had the opportunity to choose between different tasks and goals of varying effort levels, people preferred (or imposed on themselves) easier but lower-payoff options over more challenging options that awarded a higher payoff.

*Integrity.* In line with a greater focus on compensation, people incentivized with money (vs. unrewarded controls and noncash hedonic prizes of equivalent market value) cheated more—by either taking advantage of shortcuts or falsely inflating their score—on several real-effort tasks.

*Stated beliefs versus revealed behaviors.* Finally, evidence across both chapters indicates a persistent misalignment between what people do and what they intuit. Even the experience of undergoing a self-reward incentive program for multiple weeks appeared insufficient to overcome people's apparent biases in favor of cash. Whether in the context of walking, going to the gym, or completing experimenter-defined tasks, people strongly preferred cash-based (over noncash) incentive programs and predicted the former to be more motivating.

In aggregate, these findings contribute to our understanding of how incentives play a part in four important areas of human behavior: habit formation, choices involving risk and delay, goal setting, and integrity. Further, these results—including the potency of self-rewards as I have depicted across three applications—carry actionable consequences for marketers, managers, and policymakers in the way of offering alternative motivational levers (in the marketplace and workforce alike) to cash defaults. Lastly, while I have attempted to identify and integrate a diverse range of consequences that follow from (over)attending to compensation, this treatment has been far from comprehensive. Future research would benefit from continued exploration of other potential behavioral spillovers that are relevant to individual motivation, as well as a closer

inspection of the mechanisms and bounds that govern when nonmonetary incentive schemes are more likely to thrive.

## 4.2 Concluding Remarks

*We choose to go to the moon. We choose to go to the moon [...] and do the other things,  
not because they are easy, but because they are hard;  
because that goal will serve to organize and measure the best of our energies and skills,  
because that challenge is one that we are willing to accept.*  
– John F. Kennedy (1962)

Some of the most remarkable triumphs and feats of human achievement—sending mankind to the moon, eradicating smallpox, and testing the limits of athletic endurance,<sup>39</sup> to list only a few—are owed to the staunch resolve of individuals to pursue challenging problems in the wake of tremendous adversity and uncertainty. Although most of us harbor somewhat more modest ambitions in our everyday lives and professions,<sup>40</sup> we all contend with situations in which we must choose between an easier route on the one hand—that promises fewer setbacks and demands less sweat—and a harder course, on the other, that offers greater rewards but whose payoff (much like the momentous occasions I referenced earlier) is far from assured, usually not immediate, and often accompanied by uncertainty. To walk the path of least resistance is no doubt quite enticing, as it ensures, at minimal cost, some amount of goal attainment and payout. However, placing all of one’s chips into the “high-risk high-reward” alternative can at times lead to greater satisfaction and fulfillment in the long run.

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<sup>39</sup> Including, among countless other sources of inspiration, record-breaking accomplishments like scaling K2 (Lino Lacedelli and Archille Compagnoni, 1954), free soloing El Capitan (Alex Honnold, 2017), and exploring the Antarctic deep seas (*Blue Planet 2* team, 2016).

<sup>40</sup> And most likely prefer not to flirt openly with dangers belonging to the high-altitude climbing or space exploration category of vocation.

One element common to the types of achievements I introduced earlier is that they were not the product of an interest in monetary gain or any pecuniary motives. Such examples embody a drive to invest effort for its own sake—the notion of scaling a mountain “because it is there” (*e.g.*, Loewenstein 1999). Unlike endeavors that lend themselves naturally to intrinsic motivation, the behaviors featured in this dissertation, I argue, distill to self-control problems in the course of goal pursuit. Individuals, for example, prefer to improve their physical fitness but struggle to do so in the absence of any external inducement. The nonmonetary incentives I have used—even ones based on self-reward—are fundamentally *extrinsic*. They do not reflect a person’s inherent desire to perform an activity (such as going to the gym) but rather lie outside that activity. Even so, however, that meaningful differences persisted relative to cash currencies suggests that moving away from a purely monetary frame may be sufficient to change behavior in a direction more tolerant of risk and delayed gratification.

Perhaps, then, taking the findings of this dissertation to their logical (and admittedly speculative) conclusion, what is necessary—if we are to continue achieving new, paradigm-shifting heights as a society—is a general transition from incentive regimes that reinforce compensation to ones that resonate more with intrinsic motivation. And, more than ingenuity alone, we may need to rely on the willingness of individuals to confront the unknown, replete with its risks and perils, and on their resilience to persevere precisely when their efforts appear least likely to pay off.



## REFERENCES

- Abeler, Johannes, Armin Falk, Lorenz Goette, and David Huffman (2011), "Reference Points and Effort Provision," *American Economic Review*, 101 (2), 470-92.
- Aberdeen Group (2013), *Non-Cash Incentives: Best Practices to Optimize Sales Effectiveness*, [http://aberdeen.com/\\_aberdeen/sales-strategy/SENS/practice.aspx](http://aberdeen.com/_aberdeen/sales-strategy/SENS/practice.aspx).
- Akerberg, Anna, Maria Linden, and Mia Folke (2012), "How Accurate are Pedometer Cell Phone Applications?" *Procedia Technology*, 5, 787-92.
- Ainslie, George (1975), "Specious Reward: A Behavioral Theory of Impulsiveness and Impulse Control," *Psychological Bulletin*, 82 (4), 463-96.
- Ariely, Dan, Anat Bracha, and Stephen Meier (2009), "Doing Good or Doing Well? Image Motivation and Monetary Incentives in Behaving Prosocially," *The American Economic Review*, 99 (1), 544-55.
- Ashraf, Nava, Dean Karlan, and Wesley Yin (2006), "Tying Odysseus to the Mast: Evidence from a Commitment Savings Product in the Philippines," *Quarterly Journal of Economics*, 121 (2), 635-72.
- Bandiera, Oriana, Iwan Barankay, and Imran Rasul (2010), "Social Incentives in the Workplace," *Review of Economic Studies*, 77 (2), 417-58.
- Bandura, Albert (1976), "Self-Reinforcement: Theoretical and Methodological Considerations," *Behaviorism*, 4 (2), 135-55.
- Bandura, Albert and Bernard Perloff (1967), "Relative Efficacy of Self-Monitored and Externally Imposed Reinforcement Systems," *Journal of Personality and Social Psychology*, 7 (2), 111-6.
- Baumeister, Roy F. (2002), "Yielding to Temptation: Self-Control Failure, Impulsive Purchasing, and Consumer Behavior," *Journal of Consumer Research*, 28 (4), 670-6.
- Bénabou, Roland and Jean Tirole (2003), "Intrinsic and Extrinsic Motivation," *The Review of Economic Studies*, 70 (3), 489-520.
- Beshears, John, Hae Nim Lee, Katherine L. Milkman, and Rob Mislavsky (2017), "Creating Exercise Habits Using Incentives: The Tradeoff between Flexibility and Routinization," working paper, [available at <https://pdfs.semanticscholar.org/a3f9/fd231a481b088cdb0c351d8672fdbd3cda33.pdf>].
- Bonner, Sarah E. and Geoffrey B. Sprinkle (2002), "The Effects of Monetary Incentives on Effort and Task Performance: Theories, Evidence, and a Framework for Research," *Accounting, Organizations and Society*, 27 (4-5), 303-45.

- Caruso, Eugene M., Katherine D. Vohs, Brittani Baxter, and Adam Waytz (2013), "Mere Exposure to Money Increases Endorsement of Free-Market Systems and Social Inequality," *Journal of Experimental Psychology: General*, 142 (2), 301-6.
- Castro, Leonidas and Howard Rachlin (1980), "Self-Reward, Self-Monitoring, and Self-Punishment as Feedback in Weight Control," *Behavior Therapy*, 11 (1), 38-48.
- Center for Concept Development, Ltd. (2005), "Incentive Federation Study of Motivation and Incentive Applications," Falls Church, VA: Incentive Federation.
- Charness, Gary and Uri Gneezy (2009), "Incentives to Exercise," *Econometrica*, 77 (3), 909-31.
- Chen, Gilad, Stanley M. Gully, and Dov Eden (2001), "Validation of a New General Self-Efficacy Scale," *Organizational Research Methods*, 4 (1), 62-83.
- Cochran, Winona and Abraham Tesser (1996), "The "What the Hell" Effect: Some Effects of Goal Proximity and Goal Framing on Performance," in *Striving and Feeling: Interactions Among Goals, Affect, and Self-regulation*, Leonard L. Martin, and Abraham Tesser, eds., Psychology Press, 99-120.
- Condry, John and James Chambers (1978), "Intrinsic Motivation and the Process of Learning," in *The Hidden Costs of Reward: New Perspectives on the Psychology of Human Motivation*, M. R. Lepper and D. Greene, eds., Hillsdale, NJ: Erlbaum.
- Croteau, Karen A. (2004), "A Preliminary Study on the Impact of a Pedometer-based Intervention on Daily Steps," *American Journal of Health Promotion*, 18 (3), 217-20.
- Culpepper and Associates (2008), "How Companies Use Non-Cash Awards," *Culpepper eBulletin*, <https://www.shrm.org/resourcesandtools/hr-topics/compensation/pages/usenoncashawards.aspx>.
- Deci, Edward L. (1971), "Effects of Externally Mediated Rewards on Intrinsic Motivation," *Journal of Personality and Social Psychology*, 18 (1), 105-15.
- Deci, Edward L. (1972), "The Effects of Contingent and Noncontingent Rewards and Controls on Intrinsic Motivation," *Organizational Behavior and Human Performance*, 8 (2), 217-29.
- Deci, Edward L., Richard Koestner, and Richard M. Ryan (1999), "A Meta-Analytic Review of Experiments Examining the Effects of Extrinsic Rewards on Intrinsic Motivation," *Psychological Bulletin*, 125 (6), 627-68.
- DelVecchio, Devon, David H. Henard, and Traci H. Freling (2006), "The Effect of Sales Promotion on Post-Promotion Brand Preference: A Meta-Analysis," *Journal of Retailing*, 82 (3), 203-13.
- Dhar, Ravi, and Klaus Wertenbroch (2000), "Consumer Choice Between Hedonic and Utilitarian Goods," *Journal of Marketing Research*, 37, 60-71.
- Dhar, Ravi and Klaus Wertenbroch (2012), "Self-Signaling and the Costs and Benefits of Temptation in Consumer Choice," *Journal of Marketing Research*, 49 (1), 15-25.

- Dodson, Joe A., Alice M. Tybout, and Brian Sternthal (1978), "Impact of Deals and Deal Retraction on Brand Switching," *Journal of Marketing Research*, 15 (1), 72-81.
- Donatelle, Rebecca J., Deanne Hudson, Susan Dobie, Amy Goodall, Monica Hunsberger, and Kelly Oswald (2004), "Incentives in Smoking Cessation: Status of the Field and Implications for Research and Practice with Pregnant Smokers," *Nicotine and Tobacco Research*, 6 (2), S163-79.
- Dumville, Jo C., David J. Torgerson, and Catherine E. Hewitt (2006), "Reporting Attrition In Randomised Controlled Trials," *BMJ*, 332 (7547), 969-971.
- Felixbrod, Jeffrey J. and K. Daniel O'Leary (1974), "Self-Determination of Academic Standards by Children: Toward Freedom from External Control," *Journal of Educational Psychology*, 66 (6), 845-50.
- Fiske, Alan P. (1991), *Structures of Social Life: The Four Elementary Forms of Human Relations*, New York: Free Press.
- Frederick, Shane, George Loewenstein, and Ted O'Donoghue (2002), "Time Discounting and Time Preference: A Critical Review," *Journal of Economic Literature*, 40 (2), 351-401.
- Frey, Bruno S. and Felix Oberholzer-Gee (1997), "The Cost of Price Incentives: An Empirical Analysis of Motivation Crowding Out," *American Economic Review*, 87 (4), 746-755.
- Fudenberg, Drew and David K. Levine (2006), "A Dual-Self Model of Impulse Control," *American Economic Review*, 96 (5), 1449-76.
- Fujita, Kentaro, Yaacov Trope, Nira Liberman, and Maya Levin-Sagi (2006), "Construal Levels and Self-Control," *Journal of Personality and Social Psychology*, 90 (3), 351-67.
- Fulamari, Melissa and Marilyn E. Manser (1989), "Employer-Provided Benefits: Employer Cost versus Employee," *Monthly Labor Review*, 112, 24-32.
- Giné, Xavier, Dean Karlan, and Jonathan Zinman (2010), "Put Your Money Where Your Butt Is: A Commitment Contract for Smoking Cessation," *American Economic Journal: Applied Economics*, 2 (4), 213-35.
- Gino, Francesca and Cassie Mogilner (2014), "Time, Money, and Morality," *Psychological Science*, 25 (2), 414-21.
- Gino, Francesca and Lamar Pierce (2009), "The Abundance Effect: Unethical Behavior in the Presence of Wealth," *Organizational Behavior and Human Decision Processes*, 109, 142-55.
- Green, Leonard and Joel Myerson (2004), "A Discounting Framework for Choice with Delayed and Probabilistic Rewards," *Psychological Bulletin*, 130 (5), 769-92.
- Godin, G. and R.J. Shepard (1985), "Godin Leisure Time Exercise Questionnaire," *Medicine and Science in Sports and Exercise*, S36-8.

- Goswami, Indranil and Oleg Urminsky (2017), "The Dynamic Effect of Incentives on Postreward Task Engagement," *Journal of Experimental Psychology: General*, 146 (1), 1-19.
- Gneezy, Uri, Stephan Meier, and Pedro Rey-Biel (2011), "When and Why Incentives (Don't) Work to Modify Behavior," *Journal of Economic Perspectives*, 25 (4), 191-210.
- Greiner, Jerry M. and Paul Karoly (1976), "Effects of Self-Control Training on Study Activity and Academic Performance: An Analysis of Self-Monitoring, Self-Reward, and Systematic Planning Components," *Journal of Counseling Psychology*, 23 (6), 495-502.
- Hammond, Peter J. (1976), "Changing Tastes and Coherent Dynamic Choice," *Review of Economic Studies*, 43 (1), 159-73.
- Haws, Kelly and Cait Poynor (2008), "Seize the Day! Encouraging Indulgence for the Hyperopic Consumer," *Journal of Consumer Research*, 35 (4), 680-91.
- Heath, Chip, and Richard P. Larrick and George Wu (1999), "Goals as Reference Points," *Cognitive Psychology*, 38 (1), 79-109.
- Herrnstein, Richard J. and Drazen Prelec (1997), "A Theory of Addiction," in *The Matching Law*, eds. Howard Rachlin and David I. Laibson, Cambridge, MA: Harvard University Press, 160-87.
- Higgins, E. Tory, Jessica Lee, Joonmo Kwon, and Yaacov Trope (1995), "When Combining Intrinsic Motivations Undermines Interest: A Test of Activity Engagement Theory," *Journal of Personality and Social Psychology*, 68 (5), 749-67.
- Hoch, Stephen J. and George F. Loewenstein (1991), "Time-Inconsistent Preferences and Consumer Self-Control," *Journal of Consumer Research*, 17 (4), 492-507.
- Hsee, Christopher K. and Yuval Rottenstreich (2004), "Music, Pandas, and Muggers: On the Affective Psychology of Value," *Journal of Experimental Psychology: General*, 133 (1), 23-30.
- Humphrey, Laura L. Paul Karoly, and Daniel Kirschenbaum (1978), "Self-Management in the Classroom: Self-Imposed Response Cost versus Self-Reward," *Behavior Therapy*, 9, 592-601.
- Jeffrey, Scott A. (2009), "Justifiability and the Motivational Power of Tangible Noncash Incentives," *Human Performance*, 22, 143-55.
- Jeffery, Robert W., Adam Drewnowski, Leonard H. Epstein, Albert J. Stunkard, G Terence Wilson, Renar R. Wing, and Dana Robin Hill (2000), "Long-Term Maintenance of Weight Loss: Current Status," *Health Psychology*, 19 (1, Suppl), 5-16.
- Jeffery, Robert W., Paul D. Thompson, Rena R. Wing (1978), "Effects On Weight Reduction of Strong Monetary Contracts For Calorie Restriction or Weight Loss," *Behaviour Research and Therapy*, 16 (5), 363-9.
- Jenkins Jr., Douglas G., Atul Mitra, Nina Gupta, and Jason D. Shaw (1998), "Are Financial Incentives Related to Performance? A Meta-Analytic Review of Empirical Research," *Journal of Applied Psychology*, 83 (5), 777-87.

- John, Leslie K., George Loewenstein, Andrea B. Troxel, Lauri Norton, Jennifer E. Fassbender, and Kevin G. Volpp (2011), "Financial Incentives for Extended Weight Loss: A Randomized, Controlled Trial," *Journal of General Internal Medicine*, 26 (6), 621-26.
- Kamenica, Emir (2012), "Behavioral Economics and Psychology of Incentives," *Annual Review of Economics*, 4 (13), 13.1-13.26.
- Keinan, Anat and Ran Kivetz (2008), "Remedying Hyperopia: The Effects of Self-Control Regret on Consumer Behavior," *Journal of Marketing Research*, 45 (6), 676-89.
- Keinan, Anat, and Ran Kivetz (2011), "Productivity Orientation and the Consumption of Collectible Experiences," *Journal of Consumer Research*, 37 (6) 935-50.
- Kivetz, Ran (2003), "The Effects of Effort and Intrinsic Motivation on Risky Choice," *Marketing Science*, 22 (4), 477-502.
- Kivetz, Ran (2005), "Promotion Reactance: The Role of Effort-Reward Congruity," *Journal of Consumer Research*, 31 (4), 725-36.
- Kivetz, Ran and Anat Keinan (2006), "Repenting Hyperopia: An Analysis of Self-Control Regrets," *Journal of Consumer Research*, 33 (2), 273-82.
- Kivetz, Ran and Itamar Simonson (2002a), "Earning the Right to Indulge: Effort as a Determinant of Customer Preferences Toward Frequency Reward Programs," *Journal of Marketing Research*, 39 (2), 155-70.
- Kivetz, Ran and Itamar Simonson (2002b), "Self-Control for the Righteous: Toward a Theory of Precommitment to Indulgence," *Journal of Consumer Research*, 29 (2), 199-217.
- Kivetz, Ran, Oleg Urminsky, and Yuhuang Zheng (2006), "The Goal-Gradient Hypothesis Resurrected: Purchase Acceleration, Illusionary Goal Progress, and Customer Retention," *Journal of Marketing Research*, 43 (1), 39-58.
- Kivetz, Ran and Yuhuang Zheng (2006), "Determinants of Justification and Self-Control," *Journal of Experimental Psychology: General*, 135 (4), 572-87.
- Kivetz, Ran and Yuhuang Zheng (2017), "The Effects of Promotions on Hedonic Versus Utilitarian Purchases," *Journal of Consumer Psychology*, 27 (1), 59-68.
- Klein, Richard A., Kate A. Ratliff, Michelangelo Vianello, Reginald B. Adams Jr., Štěpán Bahník, Michael J. Bernstein, ..., and Brian A. Nosek (2014), "Investigating Variation in Replicability: A "Many Labs" Replication Project," *Social Psychology*, 45 (3), 142-52.
- Kruglanski, Arie W., Irith Friedman, and Gabriella Zeevi (1971), "The Effects of Extrinsic Incentive on Some Qualitative Aspects of Task Performance," *Journal of Personality*, 39 (4), 606-17.
- Latham, Gary P., and Edwin A. Locke (1991), "Self-regulation Through Goal Settings," *Organizational Behavior and Human Decision Processes*, 50 (2), 212-47.

- Lazear, Edward P. (2000), "Performance Pay and Productivity," *American Economic Review*, 90 (5), 1346-61.
- Lepper, Mark R., David Greene, and Richard E. Nisbett (1973), "Undermining Children's Intrinsic Interest with Extrinsic Reward: A Test of the 'Overjustification' Hypothesis," *Journal of Personality and Social Psychology*, 28(1), 129-137.
- Levitt, Steven D., John A. List, and Sally Sadoff (2016), "The Effect of Performance-Based Incentives on Educational Achievement: Evidence from a Randomized Experiment," No. w22107, National Bureau of Economic Research.
- Locke, Edwin A., and Gary P. Latham (1990), *A theory of goal setting & task performance*, Englewood Cliffs, NJ, US: Prentice-Hall, Inc.
- Loewenstein, George (2007), "Because It Is There: The Challenge of Mountaineering... for Utility Theory," *Kyklos*, 52 (3), 315-43.
- Mahoney, Michael J. (1974), "Self-Reward and Self-Monitoring Techniques for Weight Control," *Behavior Therapy*, 5, 48-57.
- Mahoney, Michael J., Nanci G.M. Moura, and Terry C. Wade (1973), "Relative Efficacy of Self-Reward, Self-Punishment, and Self-Monitoring Techniques for Weight Loss," *Journal of Consulting and Clinical Psychology*, 40 (3), 404-7.
- McGraw, A. Peter, Eldar Shafir, and Alexander Todorov (2010), "Valuing Money and Things: Why a \$20 Item Can Be Worth More and Less Than \$20," *Management Science*, 56 (5), 816-30.
- Mellström, Carl, and Magnus Johannesson (2008), "Crowding Out in Blood Donation: Was Titmuss Right?" *Journal of the European Economic Association*, 6 (4), 845-63.
- Mischel, Walter and Joan Grusec (1967), "Waiting for Rewards and Punishments: Effects of Time and Probability on Choice," *Journal of Personality and Social Psychology*, 5 (1), 24-31.
- Okada, Erica M. (2005), "Justification Effects on Consumer Choice of Hedonic and Utilitarian Goods," *Journal of Marketing Research*, 42 (1), 43-53.
- Pachur, Thorsten, Ralph Hertwig, and Roland Wolkewitz (2014), "The Affect Gap in Risky Choice: Affect-Rich Outcomes Attenuate Attention to Probability Information," *Decision*, 1 (1), 64-78.
- Polivy, Janet, and C. Peter Herman (1976), "Effects of Alcohol on Eating Behavior: Influence of Mood and Perceived Intoxication," *Journal of Abnormal Psychology*, 85 (6), 601-6.
- Prelec, Drazen and R. J. Herrnstein (1991), "13 Preferences or Principles: Alternative Guidelines for Choice," in *Strategy and Choice*, R. J. Zeckhauser, eds., Cambridge, MA: MIT Press.
- Prelec, Drazen and George Loewenstein (1991), "Decision Making Over Time and Under Uncertainty: A Common Approach," *Management Science*, 37 (7), 770-86.

- Prendergast, Canice (1999), "The Provision of Incentives in Firms," *Journal of Economic Literature*, 37 (1), 7-64.
- Quiggin, John, and John Horowitz (1995), "Time and Risk," *Journal of Risk and Uncertainty*, 10 (1), 37-55.
- Read, Daniel (2005), "Monetary Incentives, What are They Good For?" *Journal of Economic Methodology*, 12 (2), 265-76.
- Richardson, Caroline R., Tiffany L. Newton, Jobby J. Abraham, Ananda Sen, Masahito Jimbo, and Ann M. Swartz (2008), "A Meta-Analysis of Pedometer-Based Walking Interventions and Weight Loss," *Annals of Family Medicine*, 6 (1), 69-77.
- Rohrer, Doug, Harold Pashler, and Christine R. Harris (2015), "Do Subtle Reminders of Money Change People's Political Views?" *Journal of Experimental Psychology: General*, 144 (4), e73-e85.
- Rooney, Brenda, Kathy Smalley, Jennifer Larson, and Sarah Havens (2003), "Is Knowing Enough? Increasing Physical Activity by Wearing a Pedometer," *Wisconsin Medical Journal*, 102 (4), 31-6.
- Rottenstreich, Yuval and Christopher K. Hsee (2000), "Money, Kisses, and Electric Shocks: On the Affective Psychology of Risk," *Psychological Science*, 12 (3), 185-90.
- Rottenstreich, Yuval and Ran Kivetz (2006), "On Decision Making Without Likelihood Judgment," *Organizational Behavior and Human Decision Processes*, 101 (1), 74-88.
- Rotter, Julian B. (1954), *Social Learning and Clinical Psychology*, Englewood Cliffs, NJ: Prentice Hall.
- Soman, Dilip, and Amar Cheema (2004), "When Goals Are Counterproductive: The Effects of Violation of a Behavioral Goal on Subsequent Performance," *Journal of Consumer Research*, 31 (1), 52-62.
- Schwartz, Janet, Daniel Mochon, Lauren Wyper, Josiase Maroba, Deepak Patel, and Dan Ariely (2014), "Healthier by Precommitment," *Association for Psychological Science*, 25 (2), 538-46.
- Sequeira, Maria M., Martin Rickenbach, Vincent Wietlisbach, Benoit Tullen, and Yves Schutz (1995), "Physical Activity Assessment Using a Pedometer and Its Comparison with a Questionnaire in a Large Population Survey," *American Journal of Epidemiology*, 142 (9), 989-99.
- Shaffer, Victoria A., and Hal R. Arkes (2009), "Preference of Reversals in Evaluations of Cash Versus Non-Cash Incentives," *Journal of Economic Psychology*, 30 (6), 859-72.
- Sharif, Marissa A., and Suzanne B. Shu (2017), "The Benefits of Emergency Reserves: Greater Preference and Persistence for Goals that Have Slack with a Cost," *Journal of Marketing Research*, 54 (3).
- Shen, Luxi, Ayelet Fishback, and Christopher K. Hsee (2015), "The Motivating-Uncertainty Effect: Uncertainty Increases Resource Investment in the Process of Reward Pursuit," *Journal of Consumer Research*, 41 (5), 1301-15.

- Tangney, June P., Roy F. Baumeister, and Angie Luzio Boone (2004), "High Self-Control Predicts Good Adjustment, Less Pathology, Better Grades, and Interpersonal Success," *Journal of Personality*, 72 (2), 271-324.
- Titmuss, Richard M. (1970), *The Gift Relationship: From Human Blood to Social Policy*, Great Britain: George Allen and Unwin Ltd.
- Thaler, Richard H. (1980), "Toward a Positive Theory of Consumer Choice," *Journal of Economic Behavior and Organization*, 1 (1), 39-60.
- Touré-Tillery, Maferima, and Ayelet Fishbach (2011), "The course of motivation," *Journal of Consumer Psychology*, 21 (4), 414-23.
- Tudor-Locke, Catrine and David R. Basset, Jr. (2004), "How Many Steps/Day Are Enough?" *Sports Medicine*, 34 (1), 1-8.
- Tudor-Locke, Catrine, David R. Basset, Jr., Ann M. Swartz, Scott J. Strath, Brian B. Parr, Jared P. Reis, Katrina D. DuBose, and Barbara E. Ainsworth (2004), "A Preliminary Study of One Year of Pedometer Self-Monitoring," *Annals of Behavioral Medicine*, 28 (3), 158-62.
- Urminsky, Oleg and Ran Kivetz (2011), "Scope Insensitivity and the 'Mere Token' Effect," *Journal of Marketing Research*, 48(2), 282-295.
- Vohs, Katherine D. (2015), "Money Priming Can Change People's Thoughts, Feelings, Motivations, and Behaviors: An Update on 10 Years of Experiments," *Journal of Experimental Psychology: General*, 144(4), e86-e93.
- Volpp, Kevin G., Leslie K. John, Andrea B. Troxel, Laurie Norton, Jennifer Fassbender, and George Loewenstein (2008), "Financial Incentive-Based Approaches for Weight Loss: A Randomized Trial," *Journal of the American Medical Association*, 300 (22), 2631-7.
- Wiltermuth, Scott S. (2011), "Cheating More When the Spoils are Split," *Organizational Behavior and Human Decision Processes*, 115 (2), 157-168.
- Wyer, Robert S., and Alison Jing Xu (2010), "The role of behavioral mind-sets in goal-directed activity: Conceptual underpinning and empirical evidence," *Journal of Consumer Psychology*, 20 (2), 107-25.
- Zimmerman, Barry J. and Anastasia Kitsantas (1999), "Acquiring Writing Revision Skill: Shifting from Process to Outcome Self-Regulatory Goals," *Journal of Educational Psychology*, 91 (2), 241-250.



## APPENDICES

### Appendix A1: Additional Perspectives on the Disincentivizing Effects of Monetary Incentives

Using a principal-agent model to formally quantify the hidden costs of extrinsic incentives, Bénabou and Tirole (2003) offer a contract theory view of crowding-out phenomena that seeks to reconcile the psychological and economic perspectives. The authors posit that under asymmetric information (in which the principal is privately informed about the task or the agent's talent and the agent is unsure about his ability to perform a task), rewards are weak positive reinforcers of performance in the short term and negative reinforcers in the long term. Since the principal might reasonably offer more compensation for less pleasant tasks, uninformed agents may infer bad news from the presentation of high-powered incentives, either about the focal task or their own ability. The reduction of intrinsic motivation when facing incentive schemes in such contexts would be quite rational per this analysis. Frey and Oberholzer-Gee (1997) give one example of the signaling value of incentives; they found that offering community members monetary compensation to tolerate the presence of a nuclear waste repository decreased their inclination to do so.

In addition to explanations based on overjustification or inferences and signaling, a number of other contextual features of the decision environment (*e.g.*, default options and framing effects), may promote counterproductive results in the presence of monetary incentives. Kamenica (2012) reviews several instances in which “standard” incentives can backfire from their intended effect, while interventions that leverage choice architecture work. He argues, for example, that in some cases nonstandard preferences such as loss aversion explain why people do not react to monetary incentives in expected ways, as when they treat a default alternative as their reference outcome (*e.g.*,

Thaler 1980). In other cases, because incentive schemes can affect the technology of production, paying too much can cause people to “choke” under pressure.

## Appendix A2: Pretest of Step Comparison Between Moves and Fitbit Device

To test the absolute and relative accuracy of the Moves app compared to a more standard wearable device, I conducted a pretest on a separate sample from the same population (*i.e.*, Columbia undergraduate students) prior to implementing the study proper. I recruited eleven participants from the lab (average age = 23.2, 45% male, average BMI = 22.4) who downloaded the Moves app on their mobile phone prior to the session. Each participant had their phone (with the Moves app running in the background) in one pocket and a Fitbit device hooked to their other pocket as they walked at their normal pace along a straight, flat path in an empty area of the Columbia campus outside Uris Hall. All participants counted their steps aloud as the experimenter counted along with them. Following the recommendation of Åkerberg, Lindén, and Folke (2012), participants first walked 20 steps in a calibration phase (allowing us to measure their stride length), followed by 200 steps. I counterbalanced which side of the body each device was located across participants.

The results of the pretest suggest that using Moves yielded overall accurate data, although it tended to underestimate the number of steps walked compared to Fitbit (which instead tended to overestimate them). On the 20-step test, a one-sample *t*-test against 20 revealed that while Fitbit recorded slightly more steps than the true amount ( $M = 21.91$  [ $SD = 3.21$ ],  $t(10) = 1.97$ ,  $p = .08$ ), Moves recorded steps that did not differ from the truth ( $M = 19.09$  [ $2.95$ ],  $t(10) = -1.02$ ,  $p = .33$ ). The mobile app recorded slightly (but not significantly) fewer steps compared to its gadget counterpart ( $t(10) = 1.99$ ,  $p = .07$ ).

On the 200-step test, whereas Fitbit recorded more steps than the true amount ( $M = 202.64$  [ $3.78$ ],  $t(10) = 2.32$ ,  $p = .04$ ), Moves recorded slightly fewer steps than the truth and with higher variance ( $M = 191.73$ ,  $p = 15.55$ ,  $t(10) = -1.76$ ,  $p = .11$ ). The app recorded fewer steps compared to Fitbit ( $t(10) = 2.60$ ,  $p = .03$ ); Moves underestimated the number of steps walked for 9 out of 11 participants, while Fitbit overestimated it for 10 out of 11 participants. Despite the tendency of the

mobile app to underreport steps, I deemed its overall accuracy sufficient and preferable to using a wearable device.

### Appendix A3: Pretest of Nonprofit Organizations

To pretest the nonprofit organizations (including the National Rifle Association) later used in Studies 1 through 3, I surveyed the opinions of 31 participants recruited from the Columbia Behavioral Research Lab. Specifically, as part of a standard consumer behavior study ostensibly interested in gauging “how people feel about different organizations and companies,” each individual was tasked with rating a series of 16 different nonprofit organizations (presented in randomized order). Participants indicated how much they liked or disliked each organization using a 1 to 7 Likert scale (1 = dislike very much; 7 = like very much).

Figure A3 shows the average “liking” of each nonprofit. Although substantial heterogeneity in preferences existed across nonprofits, the NRA in particular was very negatively received and indeed viewed in the least favorable light. (This is perhaps not surprising, given the demographics and overall more progressive political leanings of the sampled population.)

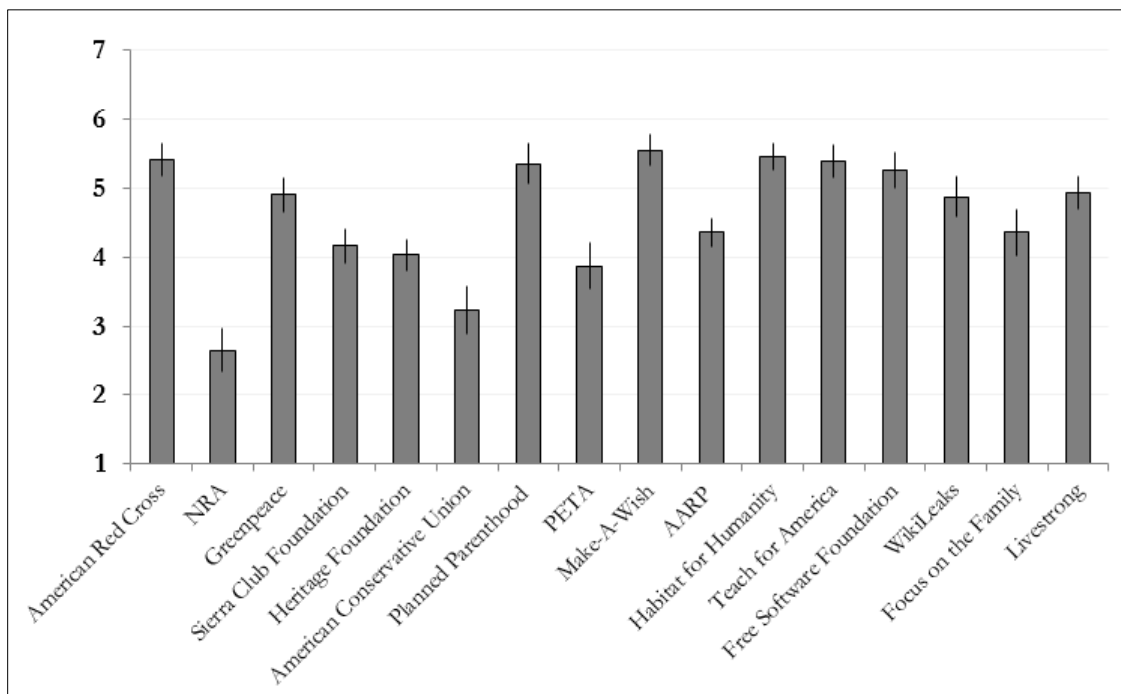


Figure A1: Perceived liking for 16 organizations (1 = dislike very much; 7 = like very much). Error bars are standard errors ( $\pm 1$  SEM).

## Appendix A4: Stimuli and Participant Instructions (Study 1)

*General instructions:*

### The Pedometer Study: Overview

As you read when you first signed-up, this is a **multiple-part study**. There will be **4 parts total**, with each part taking place exactly 1 week after the previous part.

Part 1 is this survey. Participating today means you are **committing to come to the next 3 weekly appointments**. These appointments will be very quick, though, in the form of 5-minute check-ins. You will also receive a \$3 payment for filling out a short form.

*Baseline measures of perceived physical activity:*

Please rate your level of physical activity.

Not active

1



Somewhat active

2



Moderately active

3



Very active

4



Over a **7-day period**, how many times on average do you do the following kinds of exercise for **more than 15 minutes** during your **free time**? (Indicate the appropriate number for each row.)

**STRENUOUS EXERCISE** (heart beats rapidly): e.g., running, jogging, basketball, soccer, football, vigorous swimming, vigorous bicycling, etc.

**MODERATE EXERCISE** (not exhausting): e.g., fast walking, easy bicycling, easy swimming, badminton, dancing, etc.

**MILD EXERCISE** (minimal effort): e.g., yoga, archery, fishing, bowling, golf, easy walking, etc.

*Pedometer program instructions:*

### **The Pedometer Program**

To stay active, researchers and health professional experts (including the U.S. surgeon general) recommend walking **at least 10,000 steps per day**. Many studies have also shown that people who increased their daily step count to around 10,000 steps tended to experience several health benefits (e.g., Tudor-Locke & Basset, 2004).

To help improve your health by walking more on a daily basis, you will be participating in a program for the next week. This program will use a **pedometer**, which tracks the number of steps you walk each day.

At this point, you should have already downloaded a free pedometer app, called **Moves**, onto your smartphone.

Please **get the experimenter now**, who will create and set up a unique alias account for you. The purpose of this alias account is to link your individual Moves data to a randomly generated account that *can't be traced back to your identity*. This way, the researchers can see your pedometer activity during this study without accessing any personal data or accounts you have already.

Do not proceed until the experimenter is here.

*Control condition instructions:*

### **Program terms:**

As part of this program, you'll also receive **\$20 (in cash)** at the end of each week.

### **What happens if I don't claim my reward?**

It's critical to our research that you come to the Lab for the **second appointment 7 days from today**. During this appointment, you'll be able to claim your \$20 reward.

If you don't make this appointment, that \$20 will be forfeited to a **randomly selected nonprofit organization** from the list you rated earlier:

- American Red Cross
- National Rifle Association
- Greenpeace
- Sierra Club Foundation
- Heritage Foundation
- American Conservative Union
- Planned Parenthood Federation of America
- People for the Ethical Treatment of Animals (PETA)
- Make-A-Wish Foundation
- AARP Foundation
- Habitat for Humanity
- Teach for America
- Fédération Internationale de Football Association (FIFA)
- Free Software Foundation
- WikiLeaks
- Catholic Charities USA
- Focus on the Family
- Livestrong



Please wait a moment while our system randomly selects an organization from the list.

You'll be automatically directed to the next page in a few seconds.



Missing your second appointment will result in your \$20 cash reward being forfeited to the following organization:

**National Rifle Association (NRA)**

*Cash incentive condition instructions:*

### Program terms:

As part of this program, IF you meet or exceed the target goal of **10,000 steps per day** for at least **5 days** (out of 7) OR **50,000 steps total over 7 days...**

...you will earn **\$20 in cash** as a bonus reward at the end of each week.

### What happens if I don't claim my reward?

It's critical to our research that you come to the Lab for the **second appointment 7 days from today**. During this appointment, you'll be able to claim your \$20 reward if you meet the target goal.

If you don't meet the target goal, nothing will happen.

But, if you DO meet the target goal and miss your second appointment, then your \$20 reward will be forfeited to a **randomly selected nonprofit organization** from the list you rated earlier:

- American Red Cross
- National Rifle Association
- Greenpeace
- Sierra Club Foundation
- Heritage Foundation
- American Conservative Union
- Planned Parenthood Federation of America
- People for the Ethical Treatment of Animals (PETA)
- Make-A-Wish Foundation
- AARP Foundation
- Habitat for Humanity
- Teach for America
- Fédération Internationale de Football Association (FIFA)
- Free Software Foundation
- WikiLeaks
- Catholic Charities USA
- Focus on the Family
- Livestrong

If you meet or exceed the target goal, missing your second appointment will result in your \$20 cash reward being forfeited to the following organization:

**National Rifle Association (NRA)**

*Hedonic incentive condition instructions:*

**Program terms:**

As part of this program, IF you meet or exceed the target goal of **10,000 steps per day** for at least **5 days** (out of 7) OR **50,000 steps total over 7 days...**

...you will earn **your choice of 1 reward from the following catalog** at the end of each week:

**NOTE:** All items have a retail value of approximately **\$20**.

- A box of gourmet chocolates
- 2 movie tickets (to a movie or movies of your choice)
- A gift card to Joe coffee
- A Steam Wallet Card from Valve (video games)
- A gift card to Pinkberry (frozen yogurt)
- A Groupon "Spa Day" gift card
- A Groupon "Dinner Date" gift card

To make sure we're well stocked on items, please choose which reward from the catalog you would like if you meet or exceed the target goal for **this week (i.e., the next 7 days)**.

**NOTE:** You are free to choose a different reward from the same catalog for future weeks, but for now, choose a reward (worth \$20) for this week:

- |   |   |
|---|---|
| <input type="radio"/> A box of gourmet chocolates                         | <input type="radio"/> A gift card to Pinkberry          |
| <input type="radio"/> 2 movie tickets to a movie or movies of your choice | <input type="radio"/> A Groupon "Spa Day" gift card     |
| <input type="radio"/> A gift card to Joe coffee                           | <input type="radio"/> A Groupon "Dinner Date" gift card |
| <input type="radio"/> A Steam Wallet Card from Valve                      |   |

### What happens if I don't claim my reward?

It's critical to our research that you come to the Lab for the **second appointment 7 days from today**. During this appointment, you'll be able to claim your chosen reward (worth \$20 in retail value) if you meet the target goal.

If you don't meet the target goal, nothing will happen.

But, if you DO meet the target goal and miss your second appointment, then your chosen reward will be forfeited to a **randomly selected nonprofit organization** from the list you rated earlier:

- American Red Cross
- National Rifle Association
- Greenpeace
- Sierra Club Foundation
- Heritage Foundation
- American Conservative Union
- Planned Parenthood Federation of America
- People for the Ethical Treatment of Animals (PETA)
- Make-A-Wish Foundation
- AARP Foundation
- Habitat for Humanity
- Teach for America
- Fédération Internationale de Football Association (FIFA)
- Free Software Foundation
- WikiLeaks
- Catholic Charities USA
- Focus on the Family
- Livestrong

If you meet or exceed the target goal, missing your second appointment will result in your chosen reward (worth \$20 in retail value) being forfeited to the following organization:

**National Rifle Association (NRA)**

*Self-reward incentive condition instructions:*

### **Program terms:**

As part of this program, IF you meet or exceed the target goal of **10,000 steps per day** for at least **5 days** (out of 7) OR **50,000 steps total over 7 days...**

...you will earn **your choice of a reward that you have defined yourself** as a bonus reward at the end of each week.

Specifically, this reward should be anything that you find **pleasurable but not really necessary**---something you would like to "indulge in" more but would normally feel guilty about indulging in.

This reward can be either a **tangible item** (e.g., an allowance you give yourself to spend on a good or service) or an **experience** (e.g., a few hours to read a book, take a long walk, or catch up on television, etc.). Most importantly, it should be something you feel **you don't currently afford for yourself** as much as you would like---some indulgence you really feel is "missing" from your life.

The reward you define needs to be **within your ability and resources** to give yourself **within the next 7 days from today.**

In the box below, please describe an "indulgent" reward---that **meets the criteria** described in the program terms---which you would like to give yourself in return for meeting the target goal **this week (i.e., the next 7 days)**.

Please be as thoughtful and detailed as you can (e.g., think about why you would want this reward).

**NOTE:** You are free to define a different reward for future weeks, but for now, please describe a reward for this week:

### What happens if I don't "claim" my reward?

It's critical to our research that you come to the Lab for the **second appointment 7 days from today**. During this appointment, since we can't directly observe redemption of your reward if you meet the target goal, you'll be asked to write about your experience when you consumed the reward (or your plans for consuming it in the immediate future).

If you meet the target goal this week, please provide **documentation that you consumed or plan to consume the reward you defined**. For example, if your reward was *intangible*, you can bring a picture showing you engaged in an experience you defined. If your reward was *tangible*, you can bring the actual item you purchased, or a receipt as proof.

If you don't meet the target goal, nothing will happen.

But, if you DO meet the target goal and miss the second appointment or fail to follow through with rewarding yourself with the reward you defined, then we will give away \$20 to a **randomly selected nonprofit organization** from the list you rated earlier:

- American Red Cross
- National Rifle Association
- Greenpeace
- Sierra Club Foundation
- Heritage Foundation
- American Conservative Union
- Planned Parenthood Federation of America
- People for the Ethical Treatment of Animals (PETA)
- Make-A-Wish Foundation
- AARP Foundation
- Habitat for Humanity
- Teach for America
- Fédération Internationale de Football Association (FIFA)
- Free Software Foundation
- WikiLeaks
- Catholic Charities USA
- Focus on the Family
- Livestrong

If you meet or exceed the target goal, missing your second appointment or not rewarding yourself with the reward you defined will result in us giving away \$20 to the following organization:

**National Rifle Association (NRA)**

## Appendix A5: List of Nonprofit Organizations

*Used to implement enforcement mechanism:*

Below is a list of non-profit organizations.

Please indicate **how much you like or dislike** each organization (where "1" means "dislike very much" and "7" means "like very much").

	Dislike very much 1	2	3	Neutral, or unfamiliar 4	5	6	Like very much 7
American Conservative Union	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Habitat for Humanity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Planned Parenthood Federation of America	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sierra Club Foundation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Teach for America	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Livestrong	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Dislike very much 1	2	3	Neutral, or unfamiliar 4	5	6	Like very much 7
Focus on the Family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
National Rifle Association	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
WikiLeaks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Greenpeace	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
AARP Foundation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fédération Internationale de Football Association (FIFA)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Dislike very much 1	2	3	Neutral, or unfamiliar 4	5	6	Like very much 7
Heritage Foundation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Make-A-Wish Foundation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People for the Ethical Treatment of Animals (PETA)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
American Red Cross	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Catholic Charities USA	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Free Software Foundation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



## Appendix A6: Individual Chronic Trait Measures

*Hyperopia scale* (Haws and Poynor 2008):

Please indicate how much you disagree or agree with each one of the statements below.							
	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
I often fail to enjoy attractive opportunities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It's hard for me to make myself indulge.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I regret missed opportunities to enjoy rich experiences in the past.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have difficulty pampering myself.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Seizing the day" is difficult for me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I rarely enjoy the luxuries life has to offer.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Indulgence guilt scale* (adapted from Keinan and Kivetz 2006; Kivetz and Zheng 2006):

How often does each of the below statements apply to you?							
	Never 1	2	3	4	5	6	Always 7
I tend to work too hard and not take enough time for leisure activities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend to feel guilty when I'm considering spending money on luxurious products and services that are pleasurable but not really necessary.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend to postpone activities that are just for fun.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I live for the moment and don't worry about the future.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I let myself indulge only when I really earn it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I rarely find the time to treat myself.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Self-efficacy scale* (Chen, Gully, and Eden 2001):

Please indicate how much you agree or disagree with each of the statements below.					
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I will be able to achieve most of the goals that I have set for myself.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When facing difficult tasks, I am certain that I will accomplish them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In general, I think that I can obtain outcomes that are important to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe I can succeed at most any endeavor to which I set my mind.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I will be able to successfully overcome many challenges.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confident that I can perform effectively on many different tasks.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Compared to other people, I can do most tasks very well.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Even when things are tough, I can perform quite well.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Brief self-control scale (Tangney, Baumeister, and Boone 2004):

Using the scale provided, please indicate how much each of the following statements reflects how you typically are.					
	Not at all 1	2	3	4	Very much 5
I am good at resisting temptation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a hard time breaking bad habits.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am lazy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I say inappropriate things.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do certain things that are bad for me, if they are fun.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not at all 1	2	3	4	Very much 5
I refuse things that are bad for me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I wish I had more self-discipline.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People would say that I have iron self-discipline.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pleasure and fun sometimes keep me from getting work done.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have trouble concentrating.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Not at all 1	2	3	4	Very much 5
I am able to work effectively toward long-term goals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sometimes I can't stop myself from doing something, even if I know it is wrong.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often act without thinking through all the alternatives.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Appendix A7: Weekly Exercise Log

*Sample logsheet (included with reminder packet each week):*

<b>Pedometer Program: Daily Log</b>				
Please complete this log <b>and bring it with you</b> to your third appointment. (It will save us a lot of time if you fill it out beforehand!)				
Day	Date	Number of steps recorded on Moves <sup>1</sup>	Physical activity sessions? <sup>2</sup>	Other comments <sup>3</sup>
Monday <b>(part 2)</b>	2/23/15	WALK (W): RUN (R): TOTAL (W+R):		
Tuesday	2/24/15	W: R: TOTAL:		
Wednesday	2/25/15	W: R: TOTAL:		
Thursday	2/26/15	W: R: TOTAL:		
Friday	2/27/15	W: R: TOTAL:		
Saturday	2/28/15	W: R: TOTAL:		
Sunday	3/01/15	W: R: TOTAL:		
Monday <b>(part 3: report to BRL!)</b>	3/02/15	W: R: TOTAL:		
<b>TOTAL # steps recorded on Moves (over 7 days):</b>				

<sup>1</sup> Please record these numbers accurately.  
<sup>2</sup> Did you engage in any concentrated physical activity sessions on a day, like going to the gym for an hour, jogging, or play any sports? If so, please describe **what you did** and **for how long**. If not, write "na" in the box.  
<sup>3</sup> If you run into any technical issues with Moves, this is a good place to write them. Or, any other comments you have about your experience during the week would be helpful for us to know. Thanks!

## Appendix A8: Joint Evaluation of Incentive Programs in Exit Survey

*Instructions and presentation of three reward programs:*

**You're almost done -- this is the final section, so just a few more questions.**

Below are 3 different **month-long pedometer programs**, like the one you participated in. Take a moment to carefully read the terms and requirements of each program:

### **PROGRAM A**

IF you meet or exceed the target goal of **10,000 steps per day** for at least **5 days** (out of 7) OR **50,000 steps total over 7 days**, you will earn **\$20 in cash** at the end of each week.

### **PROGRAM B**

IF you meet or exceed the target goal of **10,000 steps per day** for at least **5 days** (out of 7) OR **50,000 steps total over 7 days**, you will earn **your choice of 1 reward from the following catalog** at the end of each week:

**NOTE:** All items have a retail value of approximately **\$20**.

- A box of gourmet chocolates
- 2 movie tickets (to a movie or movies of your choice)
- A gift card to Joe Coffee
- A Steam Wallet Card from Valve (video games)
- A gift card to Pinkberry (frozen yogurt)
- A Groupon "Spa Day" gift card
- A Groupon "Dinner Date" gift card

### **PROGRAM C**

IF you meet or exceed the target goal of **10,000 steps per day** for at least **5 days** (out of 7) OR **50,000 steps total over 7 days**, you will earn **your choice of a reward that you have defined yourself** at the end of each week.

Specifically, this reward should be anything that you find **pleasurable but not really necessary**--- something you would like to "indulge in" more but would normally feel guilty about indulging in.

This reward can be either a **tangible item** (e.g., an allowance you give yourself to spend on a good or service) or an **experience** (e.g., a few hours to read a book, take a long walk, or catch up on television, etc.). Most importantly, it should be something you feel **you don't currently afford for yourself** as much as you would like---some indulgence you really feel is "missing" from your life.

The reward you define needs to be **within your ability and resources** to give yourself.

*Choice of preferred reward program and evaluation of effectiveness:*

Assume **you** could enroll, for 1 month, in one (and only one) of the programs described above. Of these 3, which program would you prefer to join?

Program A



Program B



Program C



How **effective** do you think each program would be at increasing walking activity levels for **YOU**? That is, how successful do you think **you** would be if you were to enroll in each program?

	Not at all effective						Extremely effective
	1	2	3	4	5	6	7
Program A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Program B	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Program C	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Appendix A9: Sample Size and Attrition (Study 1)

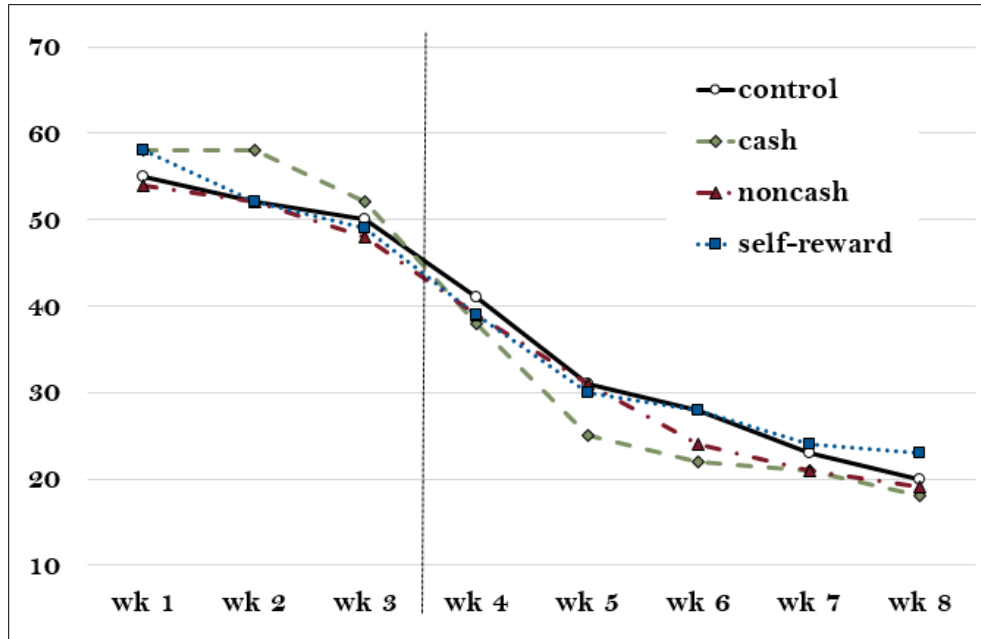


Figure A2: Sample size over time (Study 1). The vertical dotted line denotes the transition window from the incentive to post-incentive period.

Figure A2 shows the sample sizes over the course of the entire observation window in Study 1.

Attrition rates did not differ by incentive condition for each week (enrollment to week 1:  $\chi^2(3) = .67$ ,  $p = .88$ ; week 2:  $\chi^2(3) = 1.63$ ,  $p = .65$ ; week 3:  $\chi^2(3) = 1.71$ ,  $p = .64$ ; week 4:  $\chi^2(3) = 2.09$ ,  $p = .56$ ; week 5:  $\chi^2(3) = 4.48$ ,  $p = .21$ ; week 6:  $\chi^2(3) = 2.84$ ,  $p = .42$ ; week 7:  $\chi^2(3) = 1.02$ ,  $p = .80$ ; week 8:  $\chi^2(3) = 1.66$ ,  $p = .65$ ).

**Appendix A10: Randomization Check for Participants Lost to Attrition (Study 1)**

	<b>Control</b>	<b>Cash</b>	<b>Noncash</b>	<b>Self-Reward</b>	<b>Aggregate</b>
Perceived physical activity (1-4)	3.25 (.25)	2.22 (.28)	2.40 (.40)	2.50 (.19)	2.50 (.15)
Frequency of “working up a sweat” (1-3)	2.50 (.29)	1.89 (.20)	2.00 (.45)	2.00 (.19)	2.04 (.13)
Consistency of exercise routine (1-7)	4.00 (.71)	4.22 (.47)	4.80 (.49)	4.00 (.66)	4.23 (.29)
Desire to exercise more (1-7)	4.75 (.48)	5.56 (.18)	5.60 (.25)	5.38 (.42)	5.38 (.17)
Importance of more exercise (1-7)	6.25 (.25)	5.00 (.41)	5.60 (.51)	4.88 (.55)	5.27 (.25)
Self-efficacy (1-7)	3.78 (.09)	3.85 (.09)	3.93 (.22)	3.81 (.11)	3.84 (.06)
Self-control (1-5)	2.60 (.33)	3.09 (.15)	2.92 (.34)	3.14 (.29)	3.00 (.13)

*Table A1:* Baseline summary statistics of those lost to attrition at the end of week 3 (Study 1). Standard errors are in parentheses below the means for each incentive condition. The scales used for each measure are indicated in parentheses.

Table A1 shows baseline statistics among participants who attrited toward the end of week 3 (*i.e.*, the last week of the incentive period). Note that standard errors were considerably larger here due to low cell sizes. None of the individual difference measures differed as a function of incentive condition (all  $ps > .1$ ).



## Appendix A11: Sample Self-Rewards Defined (Study 1)

*Common archetypes of self-rewards defined by participants:*

“this week i would want to binge watch TV shows at the end of the week as a time to relax and zone out and disconnect from what i “should” be doing.”

“The reward I don’t normally afford for myself would be a trip to the movies with candy and a slushie. I very rarely feel like the money for a movie, especially in New York, is worth it even though I love going to the movies and the experience of watching a movie with a friend and a room full of strangers.”

“Read a book because I haven’t read for pleasure in a long time.”

“I will reward myself by taking a day to sleep in as late as I want, no alarm. I haven’t done this in ages so that would be a really great reward.”

## Appendix A12: Steps Walked During Week 2 and Week 3 of Incentive Period (Study 1)

During the second week of the incentive period, the number of total weekly steps walked differed as a function of incentive condition ( $M_{\text{control}} = 43,569$  steps [ $SD_{\text{control}} = 14,911$ ];  $M_{\text{cash}} = 53,313$  steps [ $15,590$ ];  $M_{\text{hedonic}} = 52,405$  steps [ $14,914$ ];  $M_{\text{self-reward}} = 50,583$  steps [ $16,395$ ];  $F(3,210) = 4.33, p = .006$ ). Planned contrasts revealed that compared to the control group, each of the incentive treatment arms yielded a greater step count (cash:  $t(210) = 3.30, p = .001$ ; hedonic reward:  $t(210) = 2.91, p = .004$ ; self-reward:  $t(210) = 2.31, p = .02$ ). Combined, the three treatment conditions lead to more steps walked than the control ( $t(210) = 3.46, p = .001$ ).

During the third (and last) week of the incentive period, the number of total weekly steps walked differed as a function of incentive condition ( $M_{\text{control}} = 43,336$  steps [ $SD_{\text{control}} = 14,550$ ];  $M_{\text{cash}} = 53,300$  steps [ $14,657$ ];  $M_{\text{hedonic}} = 53,249$  steps [ $16,600$ ];  $M_{\text{self-reward}} = 54,095$  steps [ $15,736$ ];  $F(3,195) = 5.53, p = .001$ ). Planned contrasts revealed that compared to the control group, each of the incentive treatment arms yielded a greater step count (cash:  $t(195) = 3.27, p = .001$ ; hedonic reward:  $t(195) = 3.19, p = .002$ ; self-reward:  $t(195) = 3.48, p = .001$ ). Combined, the three treatment conditions lead to more steps walked than the control ( $t(195) = 4.06, p < .001$ ).

### Appendix A13: Distribution of Steps Walked, Weeks 1-2 (Study 1)

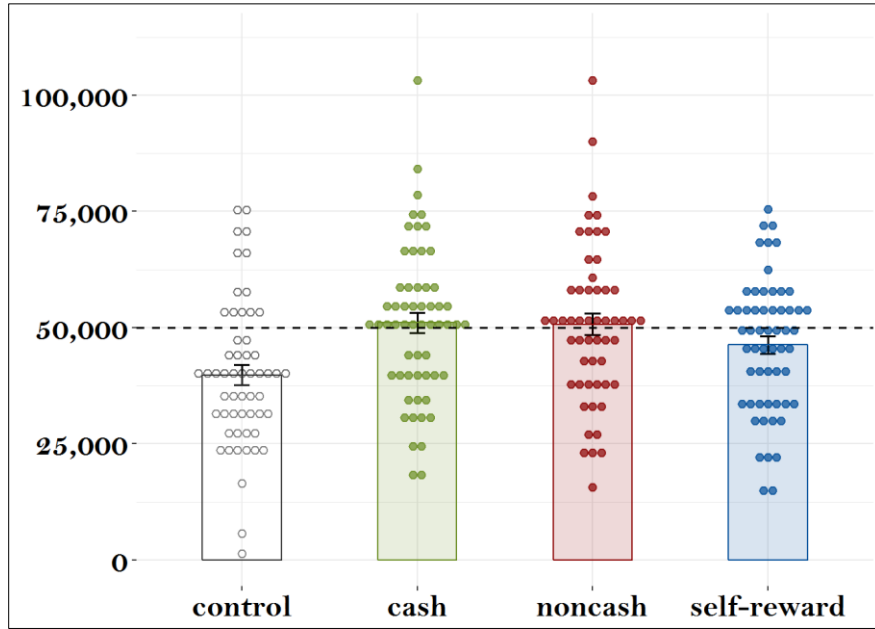


Figure A3: Distribution of steps in week 1 (Study 1). Each dot is an individual. Average number of steps for each incentive condition are overlaid. Error bars are standard errors ( $\pm 1$  SEM). The horizontal dotted line denotes the prescribed goal of 50,000 steps per week.

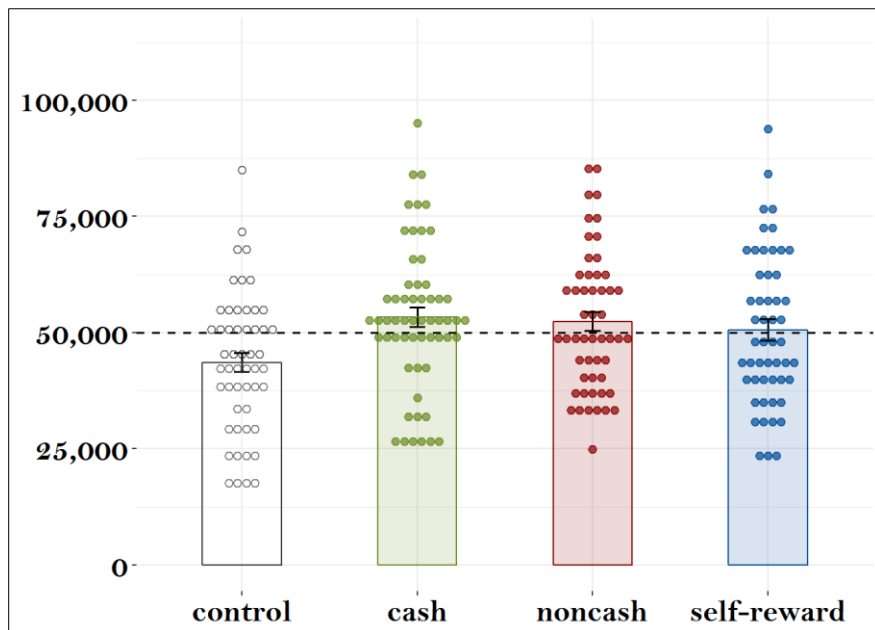


Figure A4: Distribution of steps in week 2 (Study 1). Each dot is an individual. Average number of steps for each incentive condition are overlaid. Error bars are standard errors ( $\pm 1$  SEM). The horizontal dotted line denotes the prescribed goal of 50,000 steps per week.

## Appendix A14: Supplementary Analyses of Individual Difference Measures (Study 1)

### *Perceived physical activity:*

I conducted a regression using incentive condition, a continuous measure of perceived physical activity scores (as collected during the enrollment phase), and their interaction to predict the number of steps walked across the incentive period (weeks 1-3). The results of this moderation analysis found a main effect of incentive condition ( $B = 5819, SE = 2869, t(195) = 2.03, p = .04$ ) and of perceived physical activity ( $B = 6695, SE = 7459, t(195) = 2.43, p = .02$ ), but no interaction ( $B = -1179, SE = 1074, t(195) = -1.10, p = .27$ ). Participants who indicated higher levels of physical activity indeed walked more compared to those who indicated lower levels of activity; however, this individual difference did not go on to differentially affect performance across the four incentive conditions.

### *Self-reward categorization:*

To better understand which types of self-rewards, if any, are more effective in motivating performance, I categorized the responses of participants assigned to the self-reward incentive condition along two dimensions: (i) “experiential,” where the reward defined was coded as 1 if it was experiential and as 0 if it was tangible; and (ii) “monetary,” where the reward defined was coded as 1 if it was monetary (*i.e.*, required purchasing with money to acquire or consume) and 0 otherwise (*i.e.*, did not cost money to acquire or consume).

A regression analysis found that neither of these factors significantly predicted the number of steps participants walked during week 1 (experiential:  $B = 759.67, SE = 4046.41, t(52) = .19, p = .85$ ; monetary:  $B = -2890.53, SE = 4088.10, t(52) = -.71, p = .48$ ). Similar patterns held for the remaining weeks of the experiment. Taken together, these results suggest that the effectiveness of

the self-reward incentive mechanism in improving performance extends above and beyond the exact nature of the rewards defined.

*Gender.*

An analysis of the effect of incentive condition, gender (male = 1, female = 0), and their interaction on the number of steps walked across the incentive period (weeks 1-3) revealed a main effect of incentive condition ( $F(3,191) = 9.88, p < .001$ ) and gender ( $F(1,191) = 19.20, p < .001$ ) but no incentive  $\times$  gender interaction ( $F(3,191) = .19, p = .91$ ). As expected based on physiological differences, male participants tended to walk more on average during the incentive period than their female counterparts ( $M_{\text{male}} = 55,464$  steps [ $SD = 13,415$ ] vs.  $M_{\text{female}} = 46,728$  steps [ $13,340$ ]); however, gender did not differentially affect performance across the four incentive conditions (males:  $M_{\text{control}} = 45,260$  steps [ $13,133$ ],  $M_{\text{cash}} = 58,708$  steps [ $11,514$ ];  $M_{\text{noncash}} = 58,833$  steps [ $17,178$ ];  $M_{\text{self-reward}} = 59,053$  steps [ $17,556$ ]; females:  $M_{\text{control}} = 38,713$  steps [ $11,854$ ],  $M_{\text{cash}} = 50,247$  steps [ $14,286$ ];  $M_{\text{noncash}} = 49,486$  steps [ $11,636$ ];  $M_{\text{self-reward}} = 48,466$  steps [ $11,562$ ]).

### Appendix A15: Pretest of Lay Predictions Under Joint Evaluation (Study 1)

In this pretest, I surveyed 57 respondents from the lab and presented them with a hypothetical choice between three different incentive contracts (cash, noncash, and self-reward) similar to those experienced by participants in the first pedometer study. In this case, the monetary value of the cash and noncash rewards was \$10 (rather than \$20).

Again, people displayed a strong predilection toward cash: 63.2% of respondents chose the cash incentive program, compared to 22.8% and 10.5% who chose the noncash and self-reward alternatives, respectively ( $\chi^2(2) = 49, p < .001$ ; see Figure A5). (I excluded from analysis the two participants, making up 3.5% of respondents, who chose a “none of the above” option.)

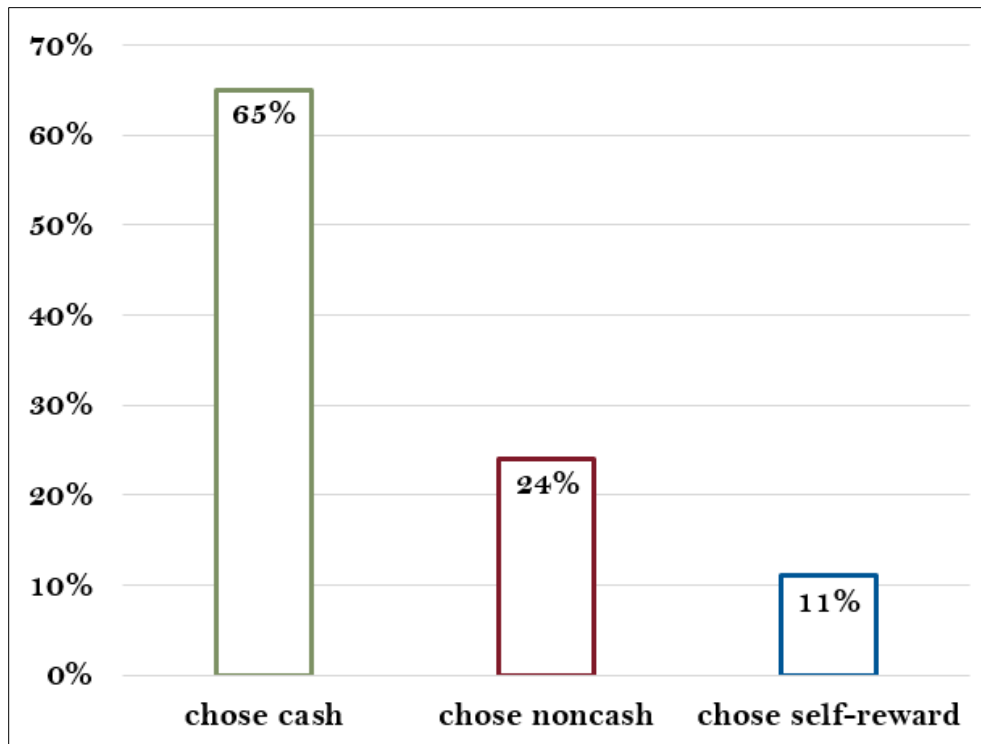


Figure A5: Choice shares of reward program.

The perceived effectiveness of the three reward programs also differed from each other ( $F(2,112) = 39.17, p < .001$ , with all post-hoc Bonferroni-corrected pairwise comparisons significant

at  $p < .001$ ). Interestingly, people tended to rate the cash reward as more motivating for them compared to the average person ( $t(56) = 2.52, p = .015$ ), the same effectiveness for the noncash reward ( $t(56) = -1.16, p = .25$ ), while they rated the self-reward as if anything slightly more effective for the average person compared to them ( $t(56) = -1.85, p = .07$ ).

### Appendix A16: Sample Size and Attrition (Study 2)

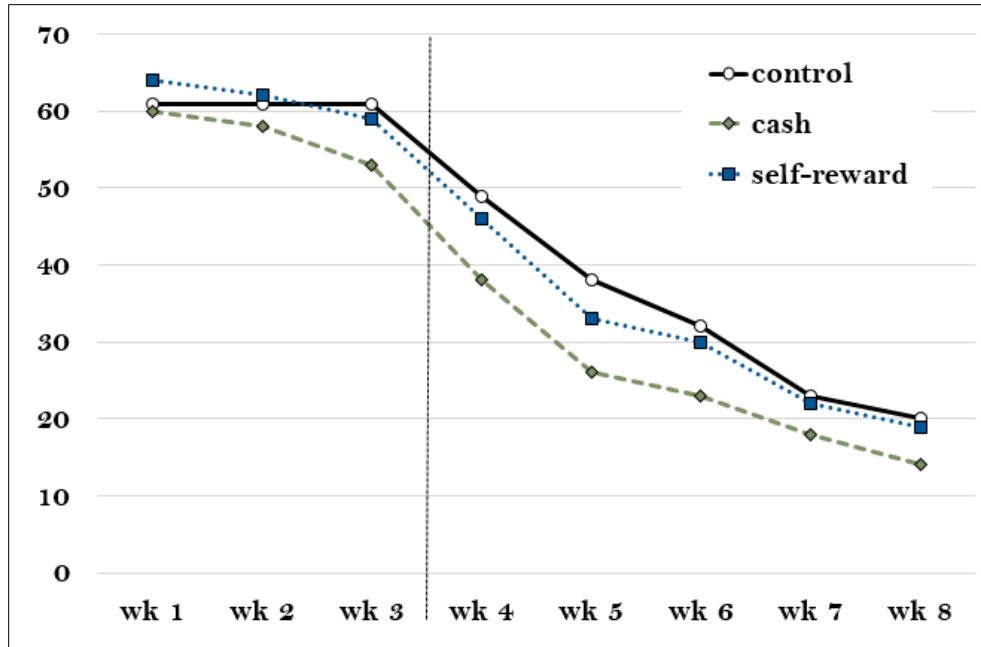


Figure A6: Sample size over time (Study 2). The vertical dotted line denotes the transition window from the incentive to post-incentive period.

Figure A6 shows the sample sizes over the course of the entire observation window in Study 2.

Attrition rates did not differ by incentive condition for each week.



## Appendix A17: Steps Walked During Week 2 and Week 3 of Incentive Period (Study 2)

The second week of the incentive period revealed a similar trend with respect to walking activity as the first, but the effects of incentive condition on total weekly steps did not differ significantly ( $M_{\text{control}} = 45,094$  steps [ $SD = 19,738$ ];  $M_{\text{cash}} = 51,633$  steps [19,259];  $M_{\text{self-reward}} = 49,897$  steps [18,791];  $F(2,177) = 1.85, p = .16$ ). Planned contrasts revealed that both incentive treatment arms produced (marginally) higher step counts relative to the control (cash:  $t(177) = 1.85, p = .07$ ; self-reward:  $t(177) = 1.38, p = .17$ ).

During the third (and last) week of the incentive period, the number of total weekly steps walked differed as a function of incentive condition ( $M_{\text{control}} = 44,241$  steps [16,842];  $M_{\text{cash}} = 54,313$  steps [20,868];  $M_{\text{self-reward}} = 52,456$  steps [15,060];  $F(2,165) = 5.28, p = .006$ ). Planned contrasts revealed that both incentive treatment arms produced higher step counts relative to the control (cash:  $t(165) = 3.02, p = .003$ ; self-reward:  $t(165) = 2.49, p = .01$ ).

### Appendix A18: Clustering Around the Goal (Study 2)

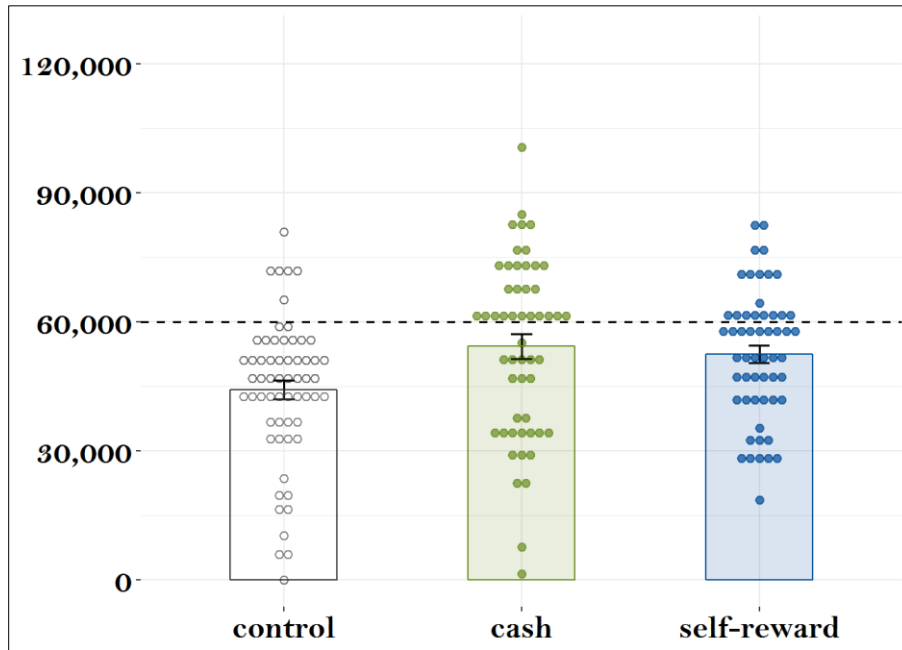


Figure A7: Distribution of steps in week 3 (Study 2). Each dot is an individual. Average number of steps for each incentive condition are overlaid. Error bars are standard errors ( $\pm 1$  SEM). The horizontal dotted line denotes the prescribed goal of 60,000 steps per week.

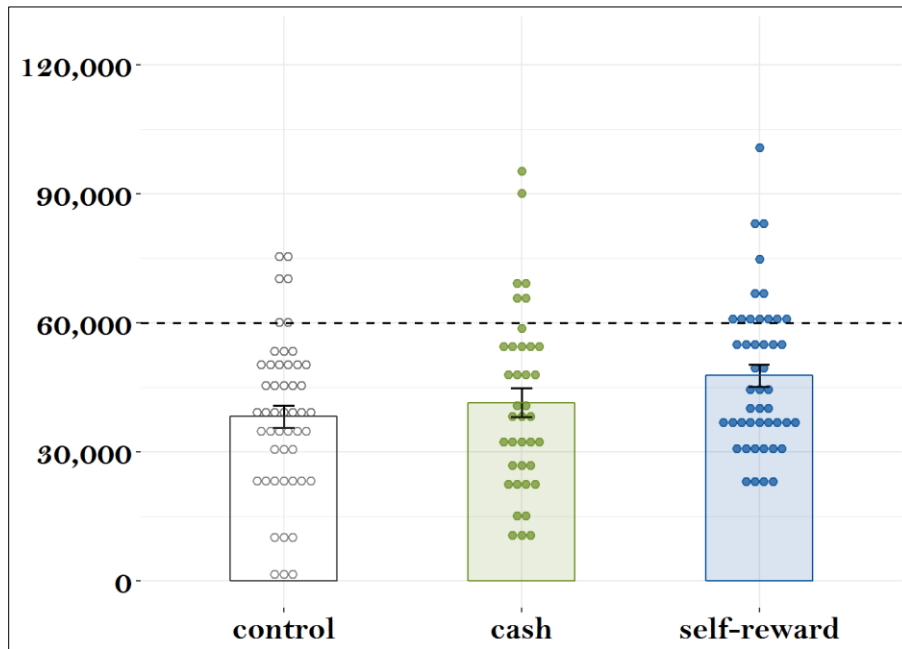


Figure A8: Distribution of steps in week 4 (Study 2). Each dot is an individual. Average number of steps for each incentive condition are overlaid. Error bars are standard errors ( $\pm 1$  SEM). The horizontal dotted line denotes the prescribed goal of 60,000 steps per week.

## Appendix A19: Stimuli and Participant Instructions (Study 3)

### *General instructions:*

#### **WHAT YOU'LL BE DOING FROM NOW UNTIL THE LAST SESSION**

Between now and the last session 3 weeks from today, you'll be asked to document each of your visits to the gym. If you didn't visit the gym during a week, you'll also be asked to document that in the app.

For purposes of this study, **ONLY** gym-related visits and activities will count, so please don't log any outside activities (even if they are related to physical fitness).

You will complete short 3-5 minute check-in surveys at the lab each week (exactly 7 days from your last appointment: e.g., Monday if your first session was on Monday, Tuesday if your first session was on Tuesday, etc.).

You'll receive **\$3** every week for attending these check-ins and providing the **documentation** (via Runkeeper) of your visits or lack of visits.

### *Instructions on documenting activities:*

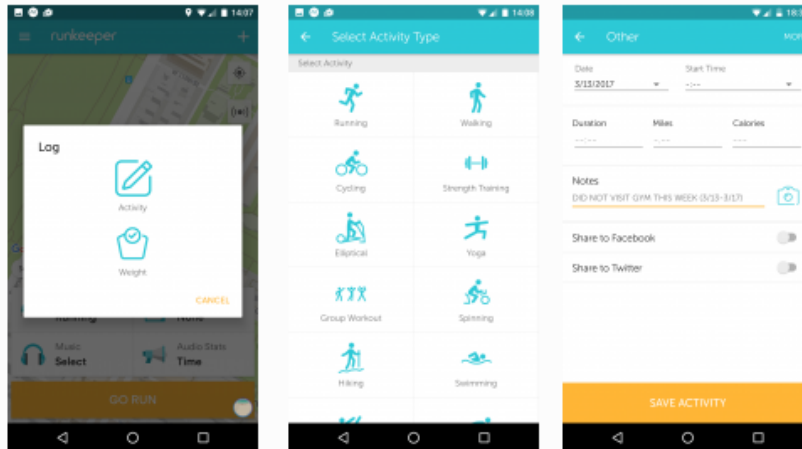
#### **A Primer on How to Log Activities on Runkeeper (please read carefully!)**

You'll be given a packet with these instructions that you can keep the rest of the study, but for now please read the information below to give you an idea of how the documentation process works (no need to physically follow the instructions on your phone right now).

Each week, use the app to track every gym visit, *even if you didn't visit the gym that week*. You'll receive your weekly check-in payment (\$3) **as long as you provide documentation of your visits or lack of visits**.

During a given week, if you DIDN'T visit the gym, make sure to document this at the end of that week:

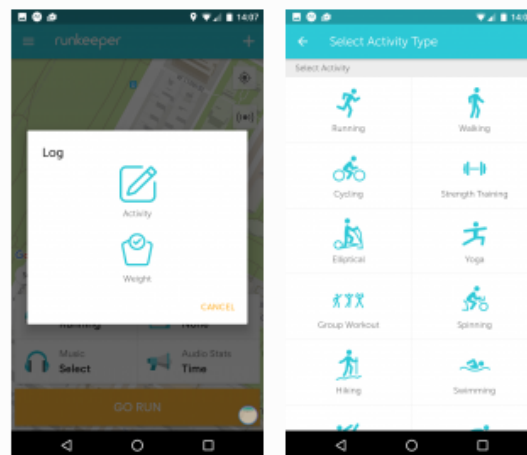
1. Select the "+" on the corner of the Runkeeper app, then **log an activity**. On the "Select Activity Type" screen, choose the **"Other"** category, then leave all the fields blank except for Date. Under the **Notes** field, write "DID NOT VISIT GYM THIS WEEK (MM/DD – MM/DD)", indicating you didn't visit the gym during those 7 days (e.g., "03/13 – 03/19"):



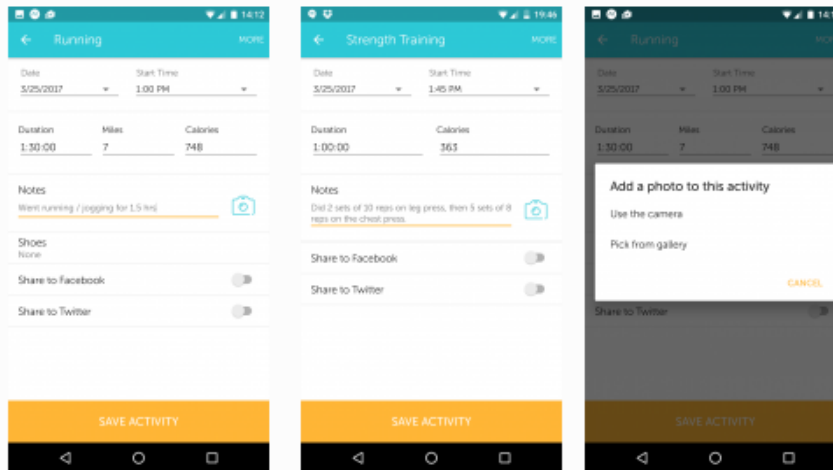
2. Press **"Save Activity"**.

During a given week, for each time you DID visit the gym, make sure to document any activities you completed in the app afterwards, as detailed below:

1. Select the "+" on the corner of the Runkeeper app, then **log an activity**. On the "Select Activity Type" screen, **choose the category** that best describes the activity you completed during your gym visit. (If you completed several different activities, repeat this **separately for each one**.)



2. On the Activity page (e.g., “Running” or “Strength Training” in the examples below), **fill out each field** (Date, Start Time, Duration in the format of Hours:Minutes:Seconds, etc.) as well as any additional details in the **Notes** field. **IMPORTANT:** For each activity you completed, you will need to submit **visual documentation that you actually performed that activity**: Press the **“Camera”** icon next to the Notes field, and use the camera to **take a photo that best represents the activity** (e.g., a treadmill if you ran on it; a specific exercise machine; a swimming pool; etc.):



3. Press **“Save Activity.”**

### FOR THE NEXT 7 DAYS...

[If you visit the gym at any point](#), make sure to log your activities using Runkeeper. **Each activity MUST have its own visual documentation** (i.e., a photo taken of it using the **camera shortcut on the app**).

[If you did not visit the gym during the week](#), make sure to log this in Runkeeper as a **comment under the "Other" activity category** on the *last day of the week* before your next appointment.

## Appendix A20: Sample Size and Attrition (Study 3)

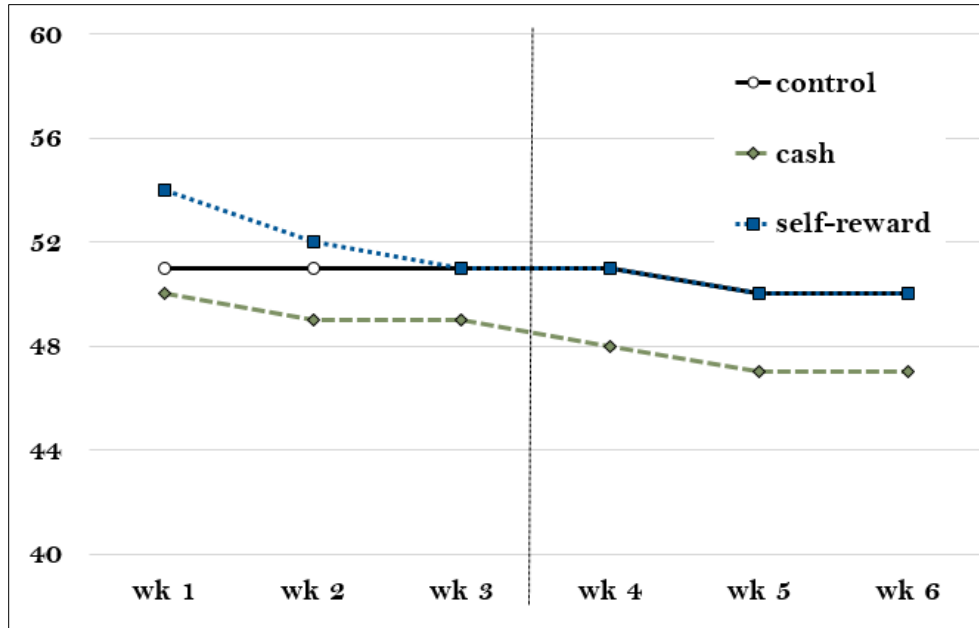


Figure A9: Sample size over time (Study 3). The vertical dotted line denotes the transition window from the incentive to post-incentive period.

Figure A9 shows the sample sizes over the course of the entire observation window in Study 3.

Attrition rates did not differ by incentive condition in any week. Note that because all participants were additionally incentivized (via a lump-sum payment of \$12) to simply keep documenting through the post-incentive period, I retained a significantly higher proportion of participants in this window compared to Studies 1 and 2.

### Appendix A21: Steps Walked During Week 2 and Week 3 of Incentive Period (Study 3)

During the second week of the incentive period, the number of visits made to the gym varied across incentive conditions ( $M_{\text{control}} = .84$  [1.14];  $M_{\text{cash}} = 2.22$  [1.39];  $M_{\text{self-reward}} = 1.71$  [1.68];  $F(2,149) = 12.08, p < .001$ ). Planned contrasts revealed that compared to the control group, each of the incentive treatment arms led to more visits (cash:  $t(149) = 4.85, p < .001$ ; self-reward:  $t(149) = 3.10, p = .002$ ). Combined, both treatment conditions generated more frequent gym visits than the control ( $t(149) = 4.60, p < .001$ ) and did not differ substantially from each other ( $t(149) = 1.81, p = .07$ ).

During the third (and last) week of the incentive period, the number of visits made to the gym varied across incentive conditions ( $M_{\text{control}} = .96$  [1.26];  $M_{\text{cash}} = 2.35$  [1.33];  $M_{\text{self-reward}} = 1.92$  [1.48];  $F(2,145) = 13.50, p < .001$ ). Planned contrasts revealed that compared to the control group, each of the incentive treatment arms led to more visits (cash:  $t(145) = 5.07, p < .001$ ; self-reward:  $t(145) = 3.50, p = .001$ ). Combined, both treatment conditions generated more frequent gym visits than the control ( $t(145) = 4.96, p < .001$ ) and did not differ from each other ( $t(145) = 1.56, p = .12$ ).

## Appendix A22: Replication Attempts for Pedometer-Based Intervention

I conducted two other pedometer studies that did not find any significant differences across conditions. In particular, contrary to expectations and prior literature, both revealed no evidence for any incentive effect among the treatment groups (cash, noncash, and self-reward) *relative to the control*. I discuss the differences in design parameters featured in these studies and analyze the reasons that may account for their failure to replicate the previous effects.

The first of these experiments was conducted between late-September and early-December of 2015 (Fall to Winter) on a separate sample of the same population (220 Columbia-affiliated students from the Columbia Business School Behavioral Research Lab). I used the same incentive specifications as Pedometer Study 1 with the following exceptions: (i) I included an additional experimental condition, *self-reward free*, which simply asked participants to define their own reward but, unlike those in the *self-reward* condition, did not specify the nature of the reward; (ii) participants first monitored their baseline performance for one week (week 0) prior to the introduction of contingent rewards during the incentive period (weeks 1-4), followed by the post-incentive period (weeks 5-8); (iii) I reduced the magnitude of the payment amount and bonus rewards from \$20 to \$5 those in the control, cash, and noncash conditions; (iv) and, perhaps most notably, those in the four treatment conditions only received the weekly bonus reward if they walked at least *70,000 steps* per week.

As anticipated, people indeed walked more steps during the incentive period (weeks 1-3) compared to the baseline week (week 0). However, this did not interact with condition: Those in the control group exhibited activity levels no different from those in each of the four treatment groups (cash, noncash, self-reward, and self-reward free) in both periods. This was true both for the number



of steps walked and the proportion meeting the goal; further, I detected no difference in performance across conditions in the post-incentive period.

Why did no incentive effects emerge in this attempted replication? I argue that a key reason is because the rewards were simply not incentivizing enough relative to the amount of effort I asked (or expected) of participants. Recall that in Pedometer Study 1 (February - April 2015), I encouraged participants to walk at least 50,000 steps per week; in this study, however, I not only increased the target performance criterion to 70,000 steps (averaging to 10,000 steps a day, a nontrivial feat given that the baseline average tended to hover around only 44,500 steps) but did so at a time in which doing so proved especially difficult due to the colder and less hospitable weather. Indeed, during the incentive period (weeks 1-4), no condition averaged above a 26% goal attainment rate, and, aggregating across all conditions, only 16% of participants met the goal. Participants walked a combined average of less than 49,000 steps, over 21,000 steps below the prescribed effort threshold.

By artificially ramping up the degree to which individuals needed to work hard in order to earn a (what may seem comparatively trivial) reward or payment, I may have curtailed the amount of “breathing room” people had to rest each week, in turn suppressing motivation during the incentive period. Indeed, previous theory on the value of flexibility suggests that individuals may prefer and perform better when they are given a greater margin for “failure” (Beshears et al. 2017; Cochran and Tesser 1996; Polivy 1976; Sharif and Shu 2017; Soman and Cheema 2004). By comparison, I found incentive effects in a study, similarly conducted from October to December 2016 (fall to winter), in which I reduced the effort threshold to 60,000 steps per week, thereby providing some measure of flexibility and “hope” for participants to obtain the goal.

In the second experiment (late-March to mid-May of 2016), I recruited Columbia students from the lab ( $N = 180$ ) under similar incentive specifications as those in Pedometer Study 2. The key difference, however, again consisted in the target performance threshold required to earn the

contingent rewards: Here participants in the treatment groups were incentivized to walk 50,000 steps each week. I again found no difference in performance levels (either in steps walked or proportion meeting the goal) as a function of condition in either the incentive or post-incentive period, with those in the control displaying activity levels as high as those in each of the two treatment groups (cash and self-reward).

I speculate that here the rewards were similarly not incentivizing enough—but for the opposite reason, since in retrospect people may have not perceived the rewards to be challenging in any capacity across the board given the low level of effort required to achieve them. This effect was likely driven in large part by the considerably warmer weather that prevailed during the incentive period (average temperatures were considerably higher during the spring to summer compared to the winter to spring interval when Pedometer Study 1 was conducted). As a result, any incentive effects that may have appeared were likely to have been suppressed, or masked, by the higher-than-expected performance levels in the control: During the incentive period (weeks 1-3), participants in the control group walked around 56,000 steps per week, well above the specified target goal, with around 61% meeting the goal. In stark opposition to the results from the first “null” study, which yielded the lowest follow-through, here we see the highest rates of goal attainment: each of the three incentive conditions averaged above a 60% goal attainment rate, with 63% meeting the goal in the aggregate.

By comparison, the patterns documented in the two field experiments where incentives “worked” (relative to control) lay in between these extremes, suggesting that they struck a happy medium in the calibration of the effort or goal with the desired behavior. In Study 1 (Section 2.6; conducted during the winter with a target goal of 50,000 weekly steps), around 26% of participants assigned to the control group met the goal, compared to proportions of over 50% in each of the three treatment conditions (leading to a combined average attainment rate of 50%). In Study 2

(Section 2.7; conducted during the spring with a target goal of 60,000 weekly steps), around 16% of control participants made the goal, compared to 46% and 27% in the cash and self-reward treatment arms, respectively (leading to a combined average attainment rate of 30%).

Taken together, I believe the results of the two studies discussed above likely reflect a failure to appropriately tune the target effort threshold in accordance with the actual effort expenditure involved during the incentive period. The lack of any incentive effect found among the treatment groups relative to the control may have emerged due to an excessively difficult goal criterion in one case (first replication attempt) and an excessively easy criterion in the other (second replication attempt). In both instances, the lack of alignment between the virtuous effort criterion and the ease or difficulty of meeting that criterion (driven in large part by seasonality differences) may have contributed to demotivation on both extremes.

The aforementioned possibility is substantiated by evidence from the goal setting literature (for review, see Locke and Latham 1990), which has found that goals that are either too easy or too difficult can be counterproductive to positive behavior change and “backfire.” On the one hand, setting targets that are perceived as too challenging to achieve (as in the case of “null” experiment 1) can contribute to what Cochran and Tesser (1996) refer to as a “what the hell” effect. For example, a person striving to keep a diet may succumb to indulgent caloric intake once they have already exceeded or violated their prescribed limit. Similarly, participants who feel they cannot reach 70,000 steps from the beginning may “give up” earlier rather than try to fulfill a goal they cannot feasibly attain. Relatedly, diminishing sensitivity in the Prospect Theory value function implies that when individuals are far away from, rather than proximal to, their goal and hence perceive little goal progress, they can often find the motivation to start a particularly ambitious task (Heath, Larrick, and Wu 1999; see also Kivetz et al. 2006).

On the other hand, setting targets that are too trivial to achieve (as in the case of “null” experiment 2) may also fail to sufficiently motivate people. Instead, individuals tend to work harder and more diligently when pursuing specific, more challenging goals (Heath et al. 1999; Locke and Latham 1991). As Locke and Latham (1991) report, of 192 studies examining goal difficulty, 91% have found that higher goals induce higher performance. Drawing from a perspective that treats goals as reference points, Heath and colleagues show that, as predicted by loss aversion, people are likely to work harder (indeed, around twice as hard) when they are approaching their goal than when they have already exceeded it.

## Appendix B1: Hedonic Catalog (Study 1a)

*As seen by participants assigned to the noncash incentive condition:*

### PROGRAM A

**Duration:** 1 month (4 weeks)

**Terms:** As part of the program, members are encouraged to walk at least **60,000 steps** total each week.

**Reward:** For EACH week that a member meets or exceeds the target goal of 60,000 steps total, he/she will earn **his/her choice of 1 reward (with retail value of \$5)** from the following gift catalog:

- A gift card to Starbucks Coffee
- A gift card to REI online (sporting equipment and outdoor gear)
- A box of gourmet chocolates (truffles with customizable flavors)
- A gift card to Macy's apparel
- An AMC movie theater gift card
- A Barnes and Noble gift card
- A Groupon "Spa Day" gift card
- A Groupon "Dinner Date" gift card
- An iTunes gift card
- A gift card to Pinkberry frozen yogurt
- An Amazon Kindle gift certificate (e-books)

### PROGRAM B

**Duration:** 1 month (4 weeks)

**Terms:** As part of the program, members are encouraged to walk at least **60,000 steps** total each week.

**Reward:** For EACH week that a member meets or exceeds the target goal of 60,000 steps total, he/she will be entered into a raffle that week with a **1 in 20 chance** of earning **his/her choice of 1 reward (with retail value of \$100)** from the following gift catalog:

- A gift card to Starbucks Coffee
- A gift card to REI online (sporting equipment and outdoor gear)
- Several boxes of gourmet chocolates (truffles with customizable flavors)
- A gift card to Macy's apparel
- An AMC movie theater gift card
- A Barnes and Noble gift card
- A Groupon "Spa Day" gift card
- A Groupon "Dinner Date" gift card
- An iTunes gift card
- A gift card to Pinkberry frozen yogurt
- An Amazon Kindle gift certificate (e-books)

## Appendix B2: Posttest of Perceived Feasibility of Step Goals (Study 3a)

*Procedure.* To elicit a baseline measure of average step count, I surveyed a separate sample of 115 respondents from the same population and asked them to give their best estimate of how many steps they typically walk each week (*i.e.*, across a period of seven days). I informed them that 10,000 steps is roughly equivalent to five miles. Next, participants read two different scenarios (order counterbalanced): In Scenario A, they imagined reading about an exercise program that encourages members to walk at least 30,000 steps total each week for a month (four weeks). Scenario B presented the same information except that the focal exercise program set a target goal of at least 75,000 steps each week. I asked participants after each scenario how feasible meeting the step goal would be for them (1 = *Not at all feasible*; 7 = *Very feasible*), as well as how likely they would be able to meet that goal (1 = *Not at all likely*; 7 = *Very likely*).

*Results.* Participants reported an average baseline step count of 29,825 steps ( $SD = 32,684$ ). Turning to the scenario responses, a mixed-design 2 (scenario)  $\times$  2 (order of presentation) ANOVA revealed a main effect of an indexed measure of perceived feasibility of meeting the goal ( $M_{30k\ steps} = 5.47$  vs.  $M_{75k\ steps} = 4.42$ ;  $F(1,113) = 56.63$ ,  $p < .001$ ), no effect of presentation order ( $F(1,113) = .22$ ,  $p = .64$ ), and no order by perception difference interaction ( $F(1,113) = .23$ ,  $p = .63$ ). I also calculated for each participant a difference score given by the gap in perceived feasibility of meeting the goal across the two scenarios (*i.e.*, subtracting the feasibility of the 75,000-step goal from that of the 30,000-step goal). The mean difference score was positive and significantly differed from zero ( $M = 1.05$ ,  $SD = 1.49$ ,  $t(114) = 7.58$ ,  $p < .001$ ), indicating greater perceived feasibility of the “easier” (*i.e.*, 30,000-step) program. Taken together, these data verify the assumption that meeting a 30,000-step performance goal should be construed as considerably more feasible (if not guaranteed) than meeting a 75,000-step goal.

## Appendix B3: Stimuli and Participant Instructions (Study 3d)

*General instructions:*

### **Cognitive Perceptions and Processes**

Although we are all unique, we share many of the same cognitive processes. This task investigates the cognitive perceptions and processes people use to solve different types of puzzles.

Today you will be doing one of two different tasks belonging to a puzzle category. You will have a choice between these tasks.

In a moment you'll be asked to **choose between two randomly selected tasks** to do related to cognitive perceptions.

*Incentive conditions only:*

In a moment you'll be asked to **choose between two randomly selected tasks** to do related to cognitive perceptions.

You will also have the chance to **earn a BONUS REWARD depending on your performance**. The details of this bonus reward will vary from task to task.

A researcher will contact you via Amazon MTurk within 3 days if you have earned the bonus reward.

*Task instructions:*

### **CATEGORY: WORD SEARCH PUZZLES**

This puzzle category contains tasks where you will be asked to **solve different word search puzzles**, each with a broad category or topic (e.g., "Sports", "Animals," etc.).

Your goal is to **name as many "target words"** as you can in the word search puzzle you choose within a given amount of time. By target words, we mean valid **English words hidden in the word search that belong to (i.e., are examples of) a given category.**

The word search will display the total number of target words in that puzzle but NOT the words themselves.

Target words can be horizontal, vertical, or diagonal. They may be written either forwards or backwards, and letters may also be shared occasionally across words.



Sample preview:

The difficulty level of the word searches will **range from easy to hard** depending on the puzzle. The larger the grid size of the word search, the harder it is to find all the target words.

To give you a sense of what you might see, below is a sample word search with a difficulty rating of **Moderate** (10 x 10 grid):

**Category: COLORS**  
**# of target words: 10**  
**Time limit: 9 minutes**

C	T	Z	O	H	S	C	N	N	W
D	N	B	A	I	N	E	E	R	G
K	K	W	L	P	H	W	P	F	A
P	J	V	O	U	O	W	I	U	D
O	E	S	C	R	E	E	N	X	H
R	R	U	S	P	B	T	K	Z	N
X	F	A	H	L	R	I	P	A	T
C	D	V	N	E	M	H	W	J	T
A	J	N	D	G	M	W	M	H	F
B	L	A	C	K	E	N	J	W	C

Target word 1:

Target word 2:

Target word 3:

Target word 4:

Target word 5:

Target word 6:

Target word 7:

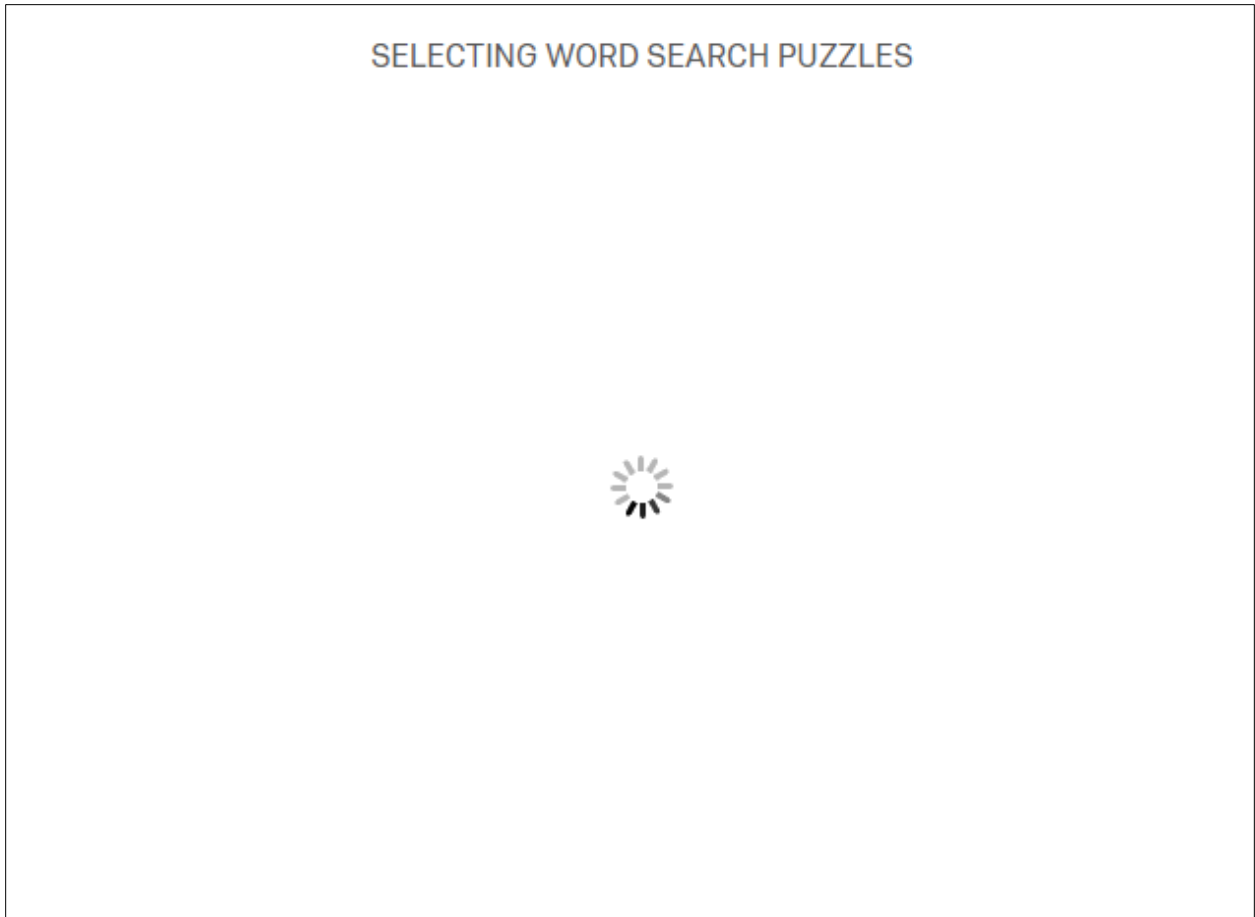
Target word 8:

Target word 9:

Target word 10:

In this example, the correct target words hidden in the puzzle are: "green", "black", "purple", "white", "blue", "orange", "red", "brown", "pink", and "silver".

*Transition loading screen:*



*Control condition:*

### WORD SEARCH PUZZLE M

**TASK:** Name **as many target words** as possible (i.e., valid English words that belong to the specified category, e.g., "Colors") hidden in the word search puzzle.

You will only see the **total number** of target words contained in the word search, **NOT** the target words themselves.

**DIFFICULTY RATING:** *Easy*

- Puzzle size: **8 x 8** grid
- # of target words: **10**
- Time limit: **9 minutes**

### WORD SEARCH PUZZLE R

**TASK:** Name **as many target words** as possible (i.e., valid English words that belong to the specified category, e.g., "Colors") hidden in the word search puzzle.

You will only see the **total number** of target words contained in the word search, **NOT** the target words themselves.

**DIFFICULTY RATING:** *Hard*

- Puzzle size: **14 x 14** grid
- # of target words: **10**
- Time limit: **9 minutes**

*Cash incentive condition:*

### WORD SEARCH PUZZLE M

**TASK:** Name **as many target words** as possible (i.e., valid English words that belong to the given category) hidden in the word search puzzle.

You will only see the **total number** of target words contained in the word search, **NOT** the target words themselves.

**DIFFICULTY RATING:** *Easy*

- Puzzle size: **8 x 8** grid
- # of target words: **10**
- Time limit: **9 minutes**

#### **BONUS REWARD RULES:**

If you are able to correctly identify **at least 80%** of the total target words, you will earn **\$5** in cash.

### WORD SEARCH PUZZLE R

**TASK:** Name **as many target words** as possible (i.e., valid English words that belong to the given category) hidden in the word search puzzle.

You will only see the **total number** of target words contained in the word search, **NOT** the target words themselves.

**DIFFICULTY RATING:** *Hard*

- Puzzle size: **14 x 14** grid
- # of target words: **10**
- Time limit: **9 minutes**

#### **BONUS REWARD RULES:**

If you are able to correctly identify **at least 80%** of the total target words, you will earn **\$10** in cash.

*Noncash incentive condition:*

## WORD SEARCH PUZZLE M

**TASK:** Name **as many target words** as possible (i.e., valid English words that belong to the given category) hidden in the word search puzzle.

You will only see the **total number** of target words contained in the word search, **NOT** the target words themselves.

**DIFFICULTY RATING:** *Easy*

- Puzzle size: **8 x 8** grid
- # of target words: **10**
- Time limit: **9 minutes**

### **BONUS REWARD RULES:**

If you are able to correctly identify **at least 80%** of the total target words, you will earn **your choice of 1 reward (with retail value of \$5) from the following electronic gift catalog:**

- A gift card to Starbucks Coffee
- A gift card to Macy's apparel
- An AMC movie theater gift card
- A Barnes and Noble gift card
- A Groupon "Spa Day" gift card
- A Groupon "Dinner Date" gift card
- A gift card to Pinkberry frozen yogurt
- An Amazon Kindle gift certificate

## WORD SEARCH PUZZLE R

**TASK:** Name **as many target words** as possible (i.e., valid English words that belong to the given category) hidden in the word search puzzle.

You will only see the **total number** of target words contained in the word search, **NOT** the target words themselves.

**DIFFICULTY RATING:** *Hard*

- Puzzle size: **14 x 14** grid
- # of target words: **10**
- Time limit: **9 minutes**

### **BONUS REWARD RULES:**

If you are able to correctly identify **at least 80%** of the total target words, you will earn **your choice of 1 reward (with retail value of \$10) from the following electronic gift catalog:**

- A gift card to Starbucks Coffee
- A gift card to Macy's apparel
- An AMC movie theater gift card
- A Barnes and Noble gift card
- A Groupon "Spa Day" gift card
- A Groupon "Dinner Date" gift card
- A gift card to Pinkberry frozen yogurt
- An Amazon Kindle gift certificate

*Easy puzzle:*

**Category: ANIMALS**  
**# of target words: 10**  
**Time limit: 9 minutes**

C O Y O T E E A  
E S R O H F R L  
X L J Y F C H A  
S V G A C A I O  
V H R A N M N K  
P I A C E E O D  
G P X R M L Y D  
F R O G K I U H

Hard puzzle:

Category: **ANIMALS**  
# of target words: **10**  
Time limit: **9 minutes**

X	J	M	Y	E	Z	Q	P	I	Z	D	N	I	T
W	N	F	L	X	F	I	H	D	L	J	J	P	F
O	M	G	T	E	C	R	R	X	E	J	B	P	U
U	A	J	F	O	M	L	J	X	O	F	F	G	K
E	N	R	Y	G	B	A	T	Y	A	J	K	I	C
T	O	O	T	I	Y	L	C	E	Q	X	Q	D	E
G	T	M	M	R	A	P	G	S	K	O	A	L	A
E	J	B	O	A	N	I	D	R	V	G	P	E	J
B	L	H	I	F	O	W	I	O	R	G	Q	R	H
W	E	T	G	F	R	T	A	H	W	S	T	V	Y
I	D	L	G	E	Z	H	P	K	R	A	H	S	E
B	S	T	F	S	K	A	I	P	I	T	Q	B	N
G	A	U	S	Y	G	P	G	N	W	H	K	G	A
S	H	V	U	Y	J	S	D	I	O	J	N	S	B



*Target word solutions and timer:*

Target word 1:	<input type="text"/>
Target word 2:	<input type="text"/>
Target word 3:	<input type="text"/>
Target word 4:	<input type="text"/>
Target word 5:	<input type="text"/>
Target word 6:	<input type="text"/>
Target word 7:	<input type="text"/>
Target word 8:	<input type="text"/>
Target word 9:	<input type="text"/>
Target word 10:	<input type="text"/>

0	7	5	2
---	---	---	---

[>>](#)

## Appendix B4: Stimuli and Participant Instructions (Study 6a)

*Task instructions:*

### **INSTRUCTIONS** (please read carefully!):

Your task is to **count zeros** in a series of tables. Below is an **example** of what you'll see:

```
11001110010100110000101100010
00111101010001011001100000101
11110100000110010000111001110
10000100111100001001110000100
01100111001100011110100001100
00010010011100000111110001111
01100011101011101000001100011
11100001100100001101010010100
11101100000100110010101001010
01100001100001100011010001111
00011000110000001110010000110
00100010100111111001100011000
11100100010111001110011111001
00000110001110010101001110001
01100111000011011100010000100
```

Once you have entered your answer, a new table will be randomly generated.

To make this task a little more challenging, you will have **90 seconds** (1 minute 30 seconds) to count each table. After 90 seconds, the page will **automatically advance**, but you can press the continue (>>) button at any time if you finish before time is up.

**NOTE:** Please try to count the zeros using just your eyes instead of with the help of external tools like the "find in page" search command.

Sample table:

How many zeros are in the table?

```
01000001101111011101110001110  
10100111011000010000010011101  
01110001110000110000010101101  
01110101101110001101101111010  
10000101010000111011010100110  
11010101010101111010101100011  
11110101001100101110111011111  
10000101100101110110100101100  
01110101100101101010001110100  
01001110011101011010011110011  
11100110001101011000101101100  
01011011101011101111111000110  
10110000110001000100010101100  
10100100100001011100110110010  
01110110100110001111001100001
```

# of zeros

*Task instructions:*

**INSTRUCTIONS** (please read carefully!):

Your task is to **unscramble** a series of jumbled words on a page in a given amount of time.

By unscramble, we mean rearrange the letters so that the resulting word forms a **(valid) English word containing all the letters of the original scrambled word.**

**SCORING:**

You will earn **10 points** for each word jumble you report successfully solving **in order from the beginning.**

This means you should try to solve the jumbles **in the order they appear.** So, for example, if you successfully unscramble the first 3 word jumbles but not the 4th, you will earn points **only for the first 3**—even if you also successfully unscramble the 5th, 6th, and 7th word jumbles.

After you unscramble each word jumble, please check the "Solved" button to indicate that you have solved the word jumble. (If you have not solved it, check the "not solved" button.)

Use only your mind, and no other tools, to solve the jumbles.

*Cash incentive condition:*

**Bonus reward rules (please read carefully!)**

As a bonus reward, if your total score falls in the **top 5%** of participants completing this study today, you will earn an additional **\$30** in cash (through MTurk).

*Noncash incentive condition:*

**Bonus reward rules (please read carefully!)**

As a bonus reward, if your total score falls in the **top 5%** of participants completing this study today, you will earn **your choice of 1 reward (with retail value of \$30)** from the following **electronic gift catalog**:

- A gift card to Starbucks Coffee
- A gift card to Macy's apparel
- An AMC movie theater gift card
- A Barnes and Noble gift card
- A Groupon "Spa Day" gift card
- A Groupon "Dinner Date" gift card
- A gift card to Pinkberry frozen yogurt
- An Amazon Kindle gift certificate

We will send a message through MTurk within 2 days if you have earned the bonus reward, with a link or redemption code to claim it.

## Appendix B5: Stimuli and Participant Instructions (Study 6b)

*Anagram task instructions:*

Please unscramble each of the word jumbles below.

After you unscramble a word jumble, please check the "Solved" button to indicate that you have solved the word jumble. (If you have not solved it, check "Not solved".)

Keep in mind that you will receive 10 points for each word jumble you solve **in order from the beginning**.

Click continue **after you have finished** or **7 minutes** have elapsed (timer below). After 7 minutes, the page will automatically advance.

*Anagrams* (appearing on a single page):

<b>1. UNHTED</b>	
Not solved <input type="radio"/>	Solved <input type="radio"/>

<b>2. EOSHU</b>	
Not solved <input type="radio"/>	Solved <input type="radio"/>

<b>3. UNAAGT</b>	
Not solved <input type="radio"/>	Solved <input type="radio"/>

#### 4. YTHOIRD

Not solved



Solved



#### 5. OLARC

Not solved



Solved



#### 6. JNIPMUG

Not solved



Solved



#### 7. HGITWE

Not solved



Solved



#### 8. CLALSOU

Not solved



Solved



## 9.YOMSEEVLD

Not solved



Solved



*Timer:*

0649





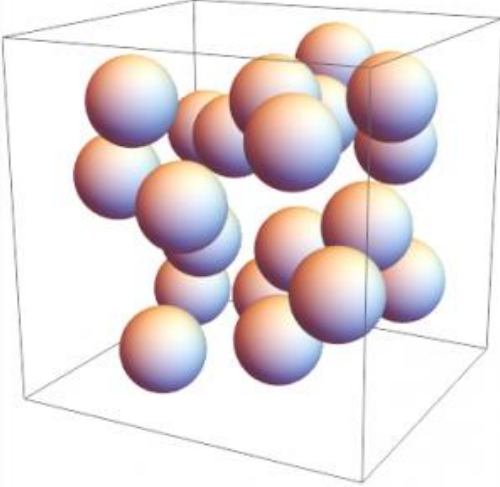
## Appendix B6: Stimuli and Participant Instructions (Study 6c)

*Task instructions:*

**Marble Guessing Game**

**INSTRUCTIONS (please read carefully!)**

In a moment, you will see a series of 5 boxes, each with a **randomly generated number of marbles** (represented by colored spheres) inside. Here's an example of something you might see—in this case, there are 20 marbles:



Your task is to give your best estimate of **how many marbles are in each box**.

You will only have **15 seconds** to examine each box and type your answer in the form provided before the page automatically moves forward. (You will see a **15-second timer** on each page.)

**IMPORTANT NOTE:** We will provide feedback after you give a response for each box, so please make sure to take notes somewhere separately in order to keep track of how many points you scored (if any) based on that feedback.

*Scoring instructions:*

Your **score** on this task will be determined by how many points you receive for each box:

- Each **exact** answer (i.e., if you guess the **exact #** of marbles depicted): **+20** points
- Each answer within **10 marbles** (i.e., between 1-10) from the actual #: **+10** points
- Each answer within **20 marbles** (i.e., between 11-20) from the actual #: **+5** points
- Each answer within **30 marbles** (i.e., between 21-30) from the actual #: **+1** point
- All other responses: **0** points

*Cash incentive condition:*

**Bonus reward rules (please read carefully!)**

You also have the chance to earn a **bonus reward** (on top of your baseline payment for completing this survey) depending on your performance on the Marble Guessing Game.

If your total score is in the **top 10%** of participants taking this study today, you will earn **\$10 in cash**.

*Noncash incentive condition:*

**Bonus reward rules (please read carefully!)**

You also have the chance to earn a **bonus reward** (on top of your baseline payment for completing this survey) depending on your performance on the Marble Guessing Game.

If your total score is in the **top 10%** of participants taking this study today, you will earn **your choice of 1 reward** (with retail value of \$10) **from the following electronic gift catalog:**

- A gift card to Starbucks Coffee
- A gift card to Macy's apparel
- An AMC movie theater gift card
- A Barnes and Noble gift card
- A Groupon "Spa Day" gift card
- A Groupon "Dinner Date" gift card
- A gift card to Pinkberry frozen yogurt
- An Amazon Kindle gift certificate

*Comprehension check:*

Before you proceed to the task, just a couple of questions to make sure the instructions were clear...

The scoring rules are reproduced below for your reference:

- Each **exact** answer (i.e., if you guess the **exact #** of marbles depicted): **+20** points
- Each answer within **10 marbles** (i.e., between 1-10) from the actual #: **+10** points
- Each answer within **20 marbles** (i.e., between 11-20) from the actual #: **+5** points
- Each answer within **30 marbles** (i.e., between 21-30) from the actual #: **+1** point
- All other responses: **0** points

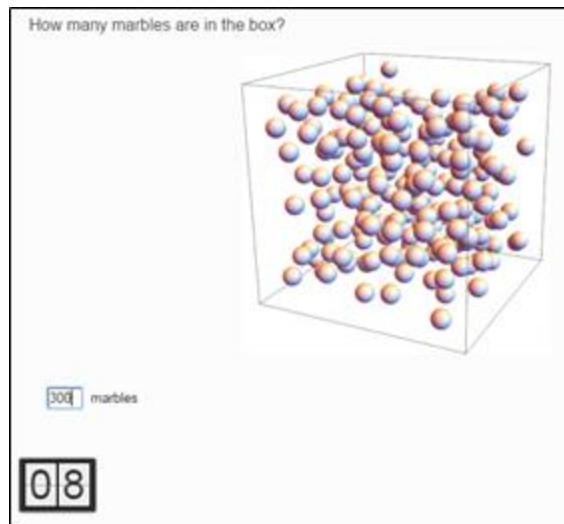
If there are 64 marbles in a box and you guess 74, how many points would you receive for that box?

- |                                |                                 |
|--------------------------------|---------------------------------|
| <input type="radio"/> 1 point  | <input type="radio"/> 10 points |
| <input type="radio"/> 2 points | <input type="radio"/> 20 points |
| <input type="radio"/> 5 points | <input type="radio"/> 0 points  |

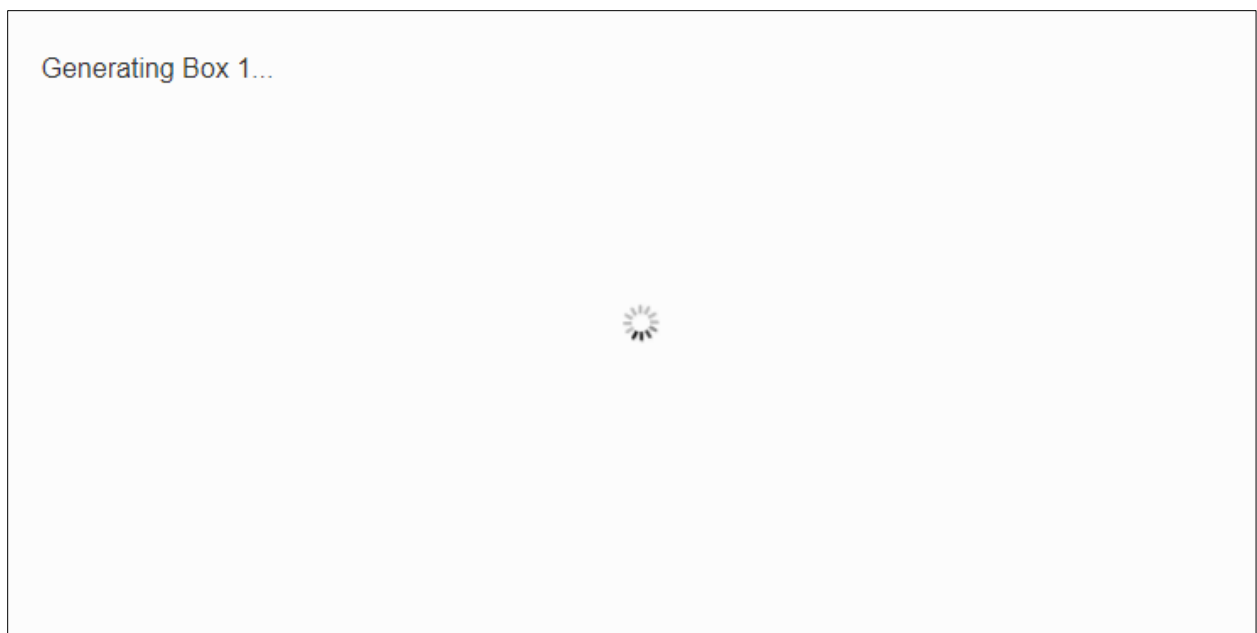
If there are 233 marbles in a box and you guess 230, how many points would you receive for that box?

- |                                |                                 |
|--------------------------------|---------------------------------|
| <input type="radio"/> 1 point  | <input type="radio"/> 10 points |
| <input type="radio"/> 2 points | <input type="radio"/> 20 points |
| <input type="radio"/> 5 points | <input type="radio"/> 0 points  |

*Sample marble estimation problem:*



*Loading page (transition):*



*Sample feedback:*

**YOUR GUESS: 300**

**ACTUAL #: 221**

Press >> to proceed.

>>

*Final score calculation instructions:*

**FINAL SCORE CALCULATION:**

Below are **your guesses (estimated # of marbles)** for each of the 5 boxes:

Box 1: **100**

Box 2: **200**

Box 3: **455**

Box 4: **314**

Box 5: **398**

Since the actual correct answers to the specific boxes you saw were not recorded as part of this survey for technical reasons, please make sure you **fill out the table below based on the number of points you scored for EACH box** (to the best of your memory as you kept track during the task).

As a reminder, your **score** is determined as follows:

- Each **exact** answer (i.e., if you guess the **exact #** of marbles depicted): **+20** points
- Each answer within **10 marbles** (i.e., between 1-10) from the actual #: **+10** points
- Each answer within **20 marbles** (i.e., between 11-20) from the actual #: **+5** points
- Each answer within **30 marbles** (i.e., between 21-30) from the actual #: **+1** point
- All other responses: **0** points

*Final score self-tabulation* (cash incentive condition):

Please fill out the fields below, which will calculate your **total score** (see last row) based on the individual points you received for each box.

Whether or not you earn the bonus reward of **\$10 cash** will depend on the total score calculated below.

Box 1 score (# points received):	<input type="text" value="0"/>	points
Box 2 score (# points received):	<input type="text" value="0"/>	points
Box 3 score (# points received):	<input type="text" value="0"/>	points
Box 4 score (# points received):	<input type="text" value="0"/>	points
Box 5 score (# points received):	<input type="text" value="0"/>	points
<b>Total</b>	<input type="text" value="0"/>	points