Designing More Effective Goals by Using Emergency Reserves: A Field Experiment

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Abstract: We test the concept of using "emergency reserves," predefined extra slack that can be used if needed but at a small cost, to improve goal performance in a field experiment requiring self-control over time. Over 240 participants tracked and recorded their steps using a pedometer application for five weeks. Participants took up to 20% more steps and reached their individual step goal up to 40% more days if they had goals with emergency reserves than if they had other types of goals. We conclude that structuring short-term goals with emergency reserves leads to both better performance and better persistence after failure, offering immediate benefits to people trying to reach important long-term goals such as saving money and losing weight.

Many of our most pressing societal challenges involve the failure of people to accomplish long-term goals, even when they are motivated to succeed. For instance, despite the desire to save money for the future, roughly a quarter of all income levels have more credit card debt than savings (*1*). Although many people want and try to lose weight (*2*), up to 66% of people who succeed in losing weight gain most of it back (*3*), and two-thirds of adults in America are still considered overweight or obese (*4*). To accomplish long-term goals like losing weight, individuals often set short-term goals, such as going to the gym every day of the week. Unfortunately, the difficulty of accomplishing these short-term goals can lead people to abandon the long-term project itself.

This paper examines whether incorporating "emergency reserves" into goals can help people reach real-life goals in a field experiment. We define an emergency reserve as pre-defined extra slack around a goal that can be used if needed but at a small cost – for example, an emergency skip day from the gym or emergency calories in a diet (*5*). We propose that participants with Reserve goals (e.g., "go to the gym 7 days of the week with 2 emergency skip days") will perform better than both those with comparable Easy goals ("go to the gym 5 days of the week") and Hard goals ("go to the gym 7 days of the week"). Reserve goals differ from other flexible goals because there is a small cost (psychological, opportunity, or future) to use the available slack/flexibility (*5-10*).

Prior research has found that people with goals with emergency reserves (e.g., goal of going to the gym 7 days of the week with 2 emergency skip days) try to resist using their emergency reserves in order to avoid incurring the small cost (psychological, opportunity, or future) for using them (*5*). As a result, people with Reserve goals strive to reach a more difficult goal/reference point (e.g., goal of going to the gym 7 days of the week), leading them to perform

better than people with goals without emergency reserves, especially better than those with Easy goals who have easier reference points (e.g., go to the gym 5 days of the week). Supporting this notion, prior research has shown that people perform better in tasks with more difficult reference points/goals (*11-13)* and that they experience a psychological cost when breaking into separate mental accounts similar to emergency reserves (*14-19*).

As noted in Sharif & Shu (2016), people with Hard goals (e.g., go to the gym 7 days of the week) may perform worse than those with Reserve goals due to the negative consequences of goal violation. Prior research has shown that violating a goal can have negative consequences (*20-24*), such as goal abandonment or deterioration of subsequent performance. Due to the available flexibility, participants with Reserve goals may be less likely to experience the same negative effects of goal violation as those with Hard goals and thus be more likely to persist.

While emergency reserves have been successfully tested in lab environments with external incentives, this paper aimed to address a few remaining questions. First, do individuals with emergency reserves perform better in personally consequential real tasks than those with other goals? Secondly, is there another benefit of the emergency reserve, other than the motivation to reach a difficult reference point; do participants with Reserve goals persist more after a failure than those with Hard goals? And, lastly, do individuals who have greater flexibility around *when* they apply their emergency reserves perform worse, better, or similarly to those with less flexibility? We examine these questions through a five-week long field study in which participants are given goals with or without reserves and record their steps with a pedometer application on their phones.

316 students and staff from a large university in the Southwest initially signed up to participate in this five-week long study. Participants were asked to track their steps for five

weeks on a pedometer application. Every night they recorded their steps on a Google spreadsheet shared with us; steps were confirmed via app screenshots. In the first week of the study, participants were asked to walk and exercise as they normally would. This baseline week allowed us to form an individual daily step goal for each participant, formulated to be 120% of his or her average steps from the baseline week.

The 273 participants who completed the baseline week were then randomly assigned to receive one of four weekly goals (Hard, Easy, Reserve-Monthly, or Reserve-Weekly). Participants' goals were to complete their step goal five days per week in the Easy condition and seven days per week in the Hard, Reserve-Weekly, and Reserve-Monthly conditions. However, participants in the Reserve-Weekly condition had two optional emergency skips each week that they could apply if they failed to reach their step goal. If they did not use them in a given week, these emergency skips did not roll over to the next week. Participants in the Reserve-Monthly condition had eight optional emergency skips throughout the entire four weeks that they could apply if they failed to reach their step goal. Participants in the Reserve-Monthly condition thus had more flexibility in when they could apply their emergency reserves; they could apply more than 2 emergency skips in a given week whereas those in the Reserve-Weekly condition could not.

After completing the baseline week, participants' Google spreadsheets were updated with their Step Goal, their Weekly goal (Hard, Easy, Reserve-Weekly, or Reserve-Monthly), a Reserve tracker (for those in the Reserve conditions), and a graphical representation of their progress. If participants successfully reached their step goal on a given day, a blue bar would show on the graph representing their progress. If they did not reach their goal, nothing would show on the graph for that day. If participants chose to apply the emergency skip on a given day,

they would click on a red "Apply Emergency Skip" button and a blue bar would show for that day (See Figure 1).

After being assigned their weekly goal, participants continued to track their steps every night for four weeks. After four weeks, participants completed a final questionnaire, which included various individual difference measures (*25-28*). Twenty-eight participants resigned or were eliminated from the study for failing to track their steps daily on the Google spreadsheet (for more details about the method please see the Supplementary Materials).

For all analyses, we conducted two separate OLS regressions predicting the dependent variable of interest from three dummy variables representing the conditions (Easy, Hard, and Reserve-Monthly or Reserve-Weekly) with the Reserve-Weekly condition as the reference group in one regression model and the Reserve-Monthly condition as the reference group in another regression model[1].

Across the four weeks of the study, participants in the Reserve-Weekly and Reserve-Monthly condition reached their step goals up to 40% more days on average per week than those in the Hard and Easy Condition, 3.11_{Easy} vs. $4.00_{Reserve\text{-}Weekly}$, $\beta = -.90$, $p = .005$; 2.83_{Hard} vs. $4.00_{Reserve\text{-}Weekly}$, $\beta = -1.18$, $p < .001$; 3.11_{Easy} vs. $3.82_{Reserve\text{-}Monthly}$, $\beta = -.72$, $p = .023$; 2.83_{Hard} vs. $3.82_{Reserve\text{-}Monthly}$, $\beta = -.98$, $p = .001$ (See Figure 2). Additionally, controlling for their step goal, participants in both Reserve conditions were more likely to take more steps on average per day than those in the Easy and Hard conditions, 6661.81_{Easy} vs. $7753.87_{Reserve\text{-}Weekly}$, $\beta = -861.04$, $p = .019$; 6678.31_{Hard} vs. $7753.87_{Reserve\text{-}Weekly}$, $\beta = -1041.64$, $p = .004$; 6661.81_{Easy} vs. $7981.27_{Reserve\text{-}Monthly}$, $\beta = -625.11$, $p = .088$; 6678.31_{Hard} vs. $7981.27_{Reserve\text{-}Monthly}$, $\beta = -805.71$, $p = .025$.

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[1] The effects reported are the Beta coefficients and *p*-values from the dummy variables in the regression models.

Therefore, participants with emergency reserves, regardless of whether they can use their reserves weekly or monthly, perform better than those without emergency reserves.

Next, we looked in the data to see if there was evidence that participants with Reserve goals try to reach a more difficult reference point (and resist using their emergency reserve) more than those with goals without emergency reserves, replicating Sharif & Shu (2016) in a personally consequential domain. In this study, the difficult reference point was for participants to reach their step goal every day, 7 days of the week. We thus examined the number of weeks (out of 4) that participants were able to reach their step goal 7 days of the week across conditions. Participants in the Reserve-Weekly and Reserve-Monthly conditions reached this difficult reference point (i.e., their step goal 7 days of the week) significantly more weeks than those with an Easy goal; .10 weeks $_{Easy}$ vs. .40 weeks $_{Reserve-Weekly}$, $\beta = -.30$, $p = .036$; .10 weeks $_{Easy}$ vs. .49 weeks $_{Reserve-Monthly}$, $\beta = -.39$, $p = .006$. Participants in the Reserve-Monthly condition were marginally significantly more likely to reach this difficult reference point more weeks than those in the Hard condition, but those in the Reserve-Weekly condition were not significantly more likely to reach this difficult reference point more weeks than those in the Hard conditions; .23 weeks$_{Hard}$ vs. .40 weeks $_{Reserve-Weekly}$, $\beta = -.17$, $p = .23$; .23 weeks $_{Hard}$ vs. .49 weeks $_{Reserve-Monthly}$, $\beta = -.26$, $p = .061$. These results replicate the finding from Sharif & Shu (2016) that participants with Reserve goals try harder to reach the difficult reference point (and resist using their emergency reserves) than those with Easy goals. Additionally, these analyses suggest that this benefit of the Reserve goal (i.e., trying hard to reach a difficult reference point) leads consumers with Reserve goals to perform better than those with Easy goals, but not always better than those with Hard goals.

We next looked in the data to see if there was some evidence that participants with Reserve goals were more likely to persist after failing to reach their step goal than those in the Hard goal condition, explaining why perhaps participants with Reserve goals performed better than those with Hard goals. If participants fail to reach their step goal just one day in the Hard goal condition, they have violated their goal. However, participants in the Reserve conditions, if they have emergency skips available, have not violated their goal if they fail to reach their step goal one day. We thus expected that participants with reserves would be more likely to persist after failing their step goal on any given day than those with a Hard goal because they will not experience the same negative effects of goal violation. Thus, we examined the proportion of times an individual succeeded at reaching their step goal after failing to reach their step goal the previous day. We first examined instances in which participants in the Reserve conditions failed to reach their step goal the previous day and could apply their emergency skip. After failing on a given day and applying their emergency skip, participants with reserves were significantly more likely to reach their step goal the next day than participants with Hard goals; $.37_{Hard}$ vs. $.55_{Reserve\text{-}Weekly}$, $\beta = -.17$, $p = .001$; $.37_{Hard}$ vs. $.54_{Reserve\text{-}Monthly}$, $\beta = -.16$, $p = .002$; $.44_{Easy}$ vs. $.55_{Reserve\text{-}Weekly}$, $\beta = -.11$, $p = .041$; $.44_{Easy}$ vs. $.54_{Reserve\text{-}Monthly}$, $\beta = -.095$, $p = .072$ (see Figure 3). Next, we examined instances in which participants in the Reserve conditions failed to reach their step goal and did not apply their emergency skip. For example, we examined instances in which participants in the Reserve-Weekly condition used two emergency skips and then failed to reach their step goal on a third day. After failing to reach their step goal on this third day, are these participants more or less likely to persist than those with goals without emergency reserves? After failing to reach their step goal and not applying their emergency skip, participants with reserves persisted about the same amount as those in the other conditions; $.37_{Hard}$ vs. $.45_{Reserve\text{-}Weekly}$, $\beta = -.07$, $p =$

n.s.; $.37_{Hard}$ vs. $.39_{Reserve-Monthly,}$ $\beta = -.02$, $p = $ n.s.; $.44_{Easy}$ vs. $.45_{Reserve-Weekly,}$ $\beta = -.01$, $p = $ n.s.; $.44_{Easy}$ vs. $.39_{Reserve-Monthly,}$ $\beta =.04$, $p = $ n.s. These results suggest that there is no backlash if participants with Reserve-Weekly and Reserve-Monthly goals fail even after using their emergency skips.

Lastly, we examined overall how likely participants in the Reserve conditions were to persist after a failure, independent of whether or not they applied their emergency reserve. Participants with Reserve goals were significantly more likely to reach their step goal the next day after failing to reach their step goal the previous day (independent of applying their emergency reserve or not) than those with a Hard goal; $.37_{Hard}$ vs. $.55_{Reserve-Weekly,}$ $\beta = -.18$, $p < .001$; $.37_{Hard}$ vs. $.48_{Reserve-Monthly,}$ $\beta = -.10$, $p = .03$; $.44_{Easy}$ vs. $.55_{Reserve-Weekly,}$ $\beta = -.11$, $p = .02$; $.44_{Easy}$ vs. $.48_{Reserve-Monthly,}$ $\beta = -.04$, $p = $ n.s. Thus, these results suggest that emergency reserves help participants persist in the face of a failure. When participants fail and apply their emergency reserve, they are more likely to persist the next day than those with a Hard goal; if they fail and do not apply their emergency reserve, they persist about the same as those with a Hard goal. This leads to an overall positive persistence benefit. Thus, since participants with Reserve goals are more likely to persist after failing their step goal on any given day than those with a Hard goal, they end up performing better (e.g., reach their step goals more days) then those with a Hard goal.

We found that the participants' performance with Reserve-Monthly goals compared to Hard goals depended on their trait-level self-control (Reserve-Monthly vs. Hard x Self-Control Interaction, $\beta = -.98$, $p = .050$). Participants with high self-control (self-control scores greater than 2.82 out of 5) reached their step goal significantly more days per week with Reserve-Monthly goals than those with Hard goals; Johnson-Neyman point $= 2.82/5$ (See Figure 4).

However, for individuals with low self-control, there was no significant difference in performance between participants with these different goal types. This suggests that the extra flexibility in when participants can apply emergency reserves in the Reserve-Monthly condition may be most beneficial to those with high self-control. Individual differences did not seem to affect the effectiveness of Reserve-Weekly goals, which were beneficial to individuals at all levels.

Lastly, participants were asked to self-report their weight at the beginning of the study and again at the end of the study. Participants in the Reserve-Weekly condition reported losing more weight than those in all of the conditions; -.38 pounds $_{Reserve-Monthly}$ vs. -3.64 pounds $_{Reserve-Weekly}$, $\beta = 3.27$, $p = .022$; .13 pounds $_{Easy}$ vs. -3.64 pounds $_{Reserve-Weekly}$, $\beta = 3.77$, $p = .009$; -.37 pounds $_{Hard}$ vs. -3.64 pounds $_{Reserve-Weekly}$, $\beta = 3.27$, $p = .020$. While we acknowledge this is a self-report measure, this provides some preliminary evidence that emergency reserves may help people reach their long-term goals, such as losing weight.
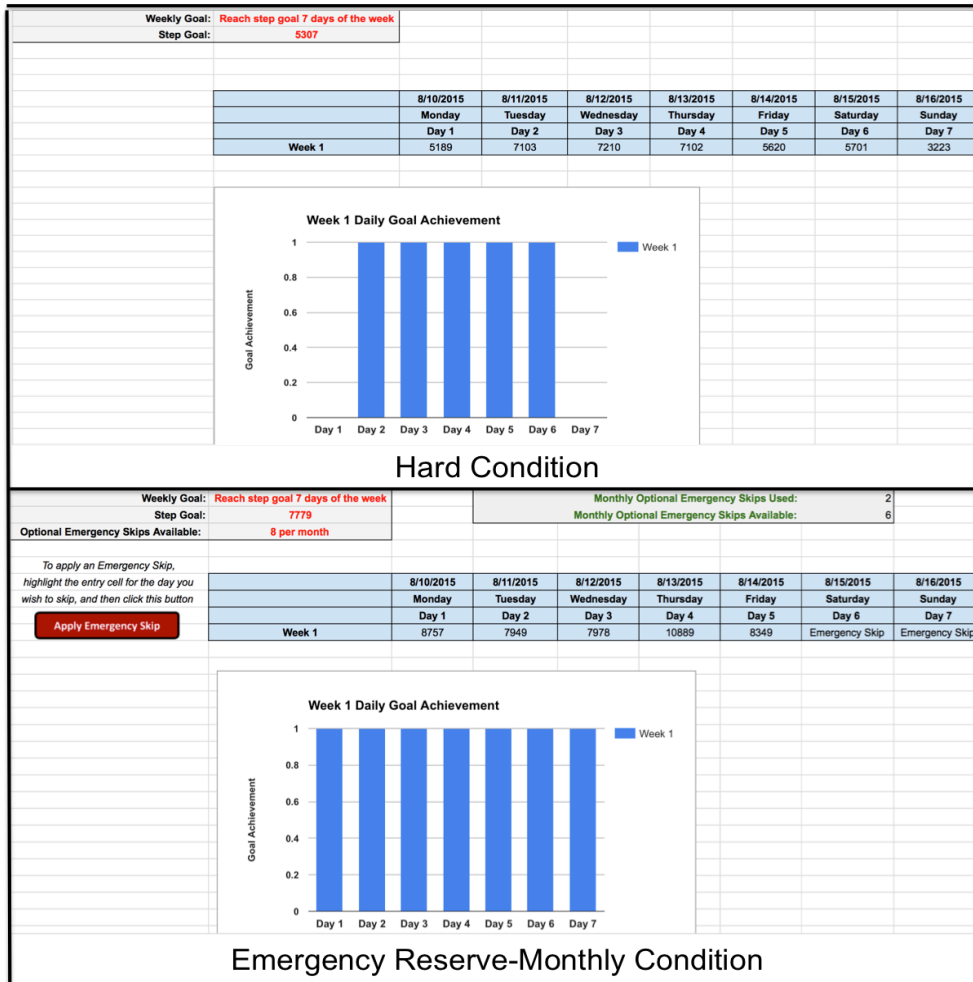
Providing goal flexibility with a psychological cost via an emergency reserve helps people perform better on short-term goals, ultimately leading to measurably better performance on long-term goals. Using real-life exercise goals in a month long field experiment, individuals benefitted significantly from access to reserves. As people struggle to achieve long-term goals like saving money, losing weight, or studying for a test, emergency reserves offer the potential to help improve the lives of many.

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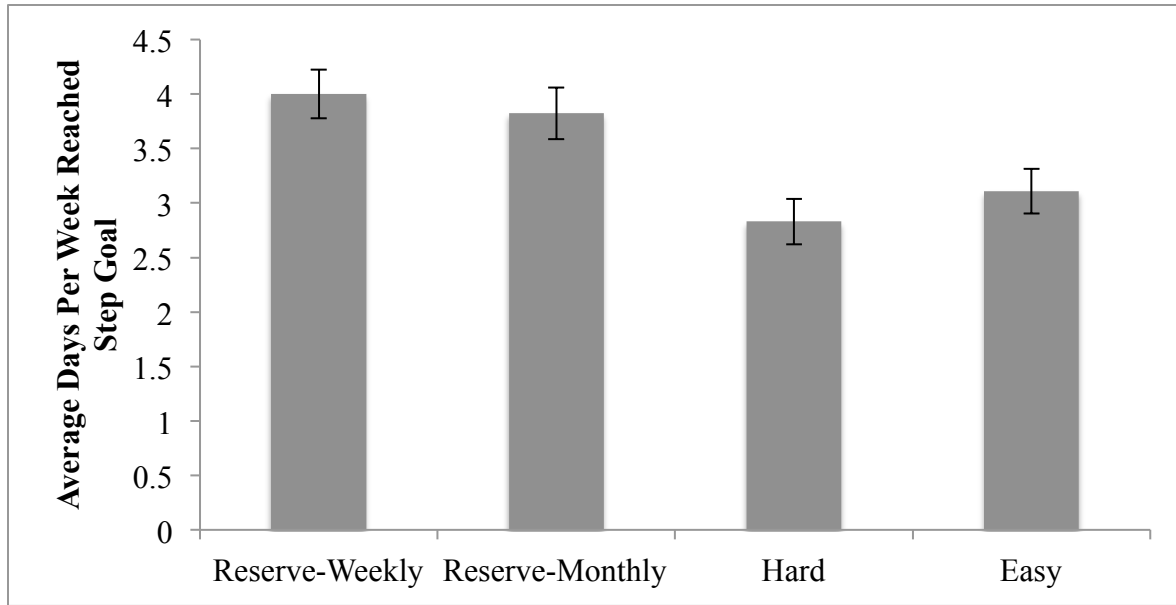
Figures

Fig 1. *Two Screenshots of the Google Spreadsheets for two participants (one in the Hard Condition and one in the Reserve-Monthly condition) who reach their step goal 5 days of the week.*

Fig. 2. *Histogram displaying the average days per week that participants reached their individual step goal.*
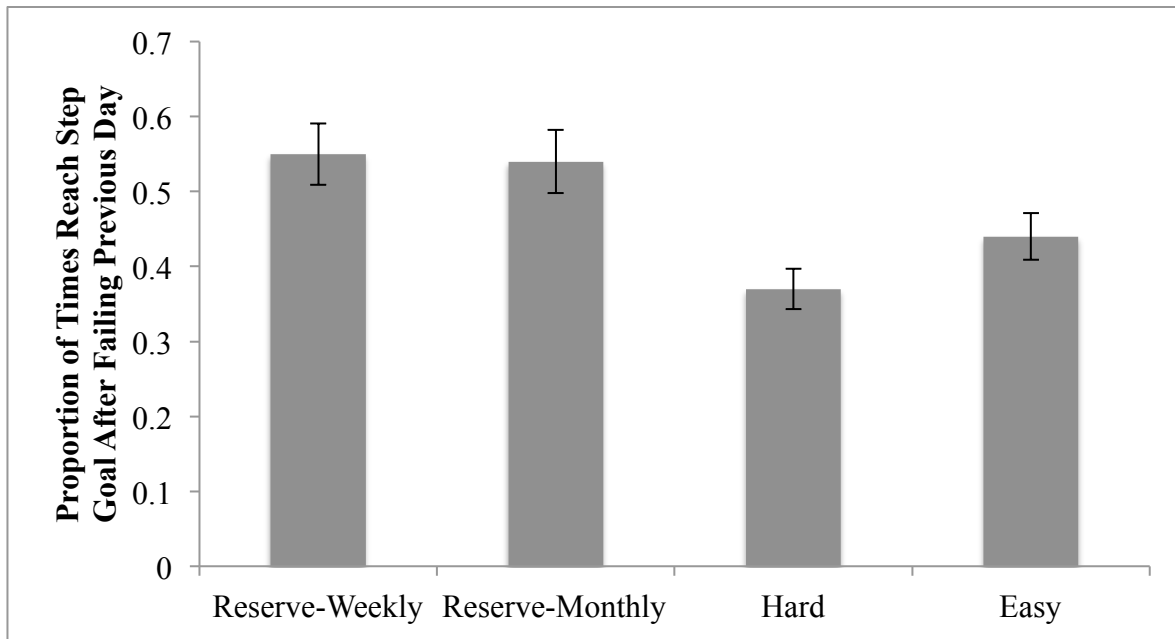

Fig. 3. *Histogram displaying the proportion of times participants succeeded the next day after failing to reach their step goal the previous day (and applying their reserve in the emergency reserve conditions) split by condition.*
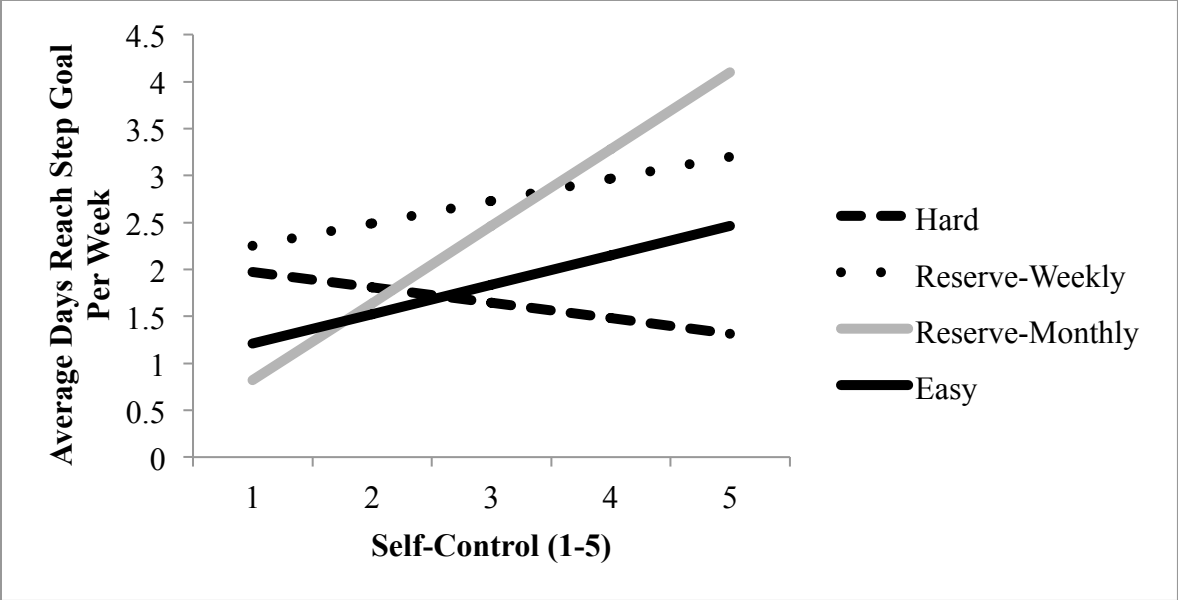
Fig. 4. *Line graph plotting performance (average days per week) as a function of self-control split by condition.*

<u>Supplementary Materials</u>

MORE DETAILS ON METHODS

This experiment had three phases. In the first phase, participants completed an initial questionnaire and tracked their steps without any goal. In the second phase, they were assigned a weekly goal and a step goal, completed a brief questionnaire, and tracked their steps for four weeks. In the third phase, they completed a third questionnaire.

First Phase

316 students and staff from a large university in the southwest signed up for this study. Participants were informed that they only qualify for the survey if they have 1) an iPhone or Android smart phone, 2) willing to download a free app on their phone, 3) able to update a spreadsheet of their steps on a daily basis, 4) able to e-mail screenshots from their phone on a weekly basis of the number of steps you take, 5) be available to complete three questionnaires a) initially, b) after 1 week, and c) after 5 weeks.

If participants still wanted to participate in the study, they answered the following questions:

1) Are you a graduate, undergraduate, staff, or faculty?
2) Are you currently enrolled in summer school?
      a. How many classes are you taking?
3) Which smart phone do you have?
      a. Which model do you have (e.g., iPhone 4, iPhone 6, Samsung Galaxy S4, etc.)
4) How much do you weigh?
5) How tall are you?
6) Do you currently want to improve your physical fitness?
7) Do you currently want to lose weight?
8) How often do you currently engage in physical exercise?
9) How often do you set fitness goals?
10) How often do you set weight loss goals?
11) How often do you achieve your fitness goals?
12) How often do you achieve your weight loss goals?
13) Which reason below best describes the reason why you signed up for this study? *Because I want to become more fit*, *Because I want to earn more money*, or *Because I'm interested in participating in this study*

Afterwards, participants received instructions on how to download and install the pedometer application, *Pacer*. They also received instructions on how to use the application and how to view the weekly graph that they were asked to send to the researchers.

Participants were highly encouraged to carry their phone with them at all times and to carry it in their hand, pocket, or purse. They were told to contact the researchers if their steps were not recorded. Participants received $2.50 for every questionnaire they completed. They received a $40 bonus if they completed all steps of the experiment on time (e.g., sent in all of their weekly

screenshots, updated their Google spreadsheet on a daily basis, and completed all questionnaires on time).

After completing this initial questionnaire, participants were sent an email with a link to their shared Google spreadsheet in order to start tracking their steps. The email also contained instructions on how to use the Google spreadsheet. All participants began tracking their steps on the same day. Participants were asked to exercise as they normally would for a week and to record their steps nightly on the Google Spreadsheet.

Second Phase

On the last day of the baseline week, participants were asked to complete another questionnaire. 43 participants had resigned or were eliminated from the study at this point.

Participants' Google Spreadsheets were updated with Week 1, Week 2, Week 3, and Week 4 tabs. Participants received a Step goal that was 120% of their average steps from the baseline week. Additionally, they were randomly assigned to a weekly goal. In the Hard, Reserve-Weekly, and Reserve-Monthly conditions, they were assigned to reach their step goal 7 days of the week. In the Easy condition, they were assigned to reach their step goal 5 days of the week. The Google spreadsheet displayed the Step Goal, the Weekly goal, and a graph representing their daily progress. Participants received instructions on where these goals were located on the spreadsheet and also what would happen if they succeeded at their daily goal (a blue bar would emerge on the graph) and if they failed to reach their daily goal (no blue bar would emerge).

Additionally, participants in the Reserve-Weekly Condition were told, "You have 2 optional 'emergency skip' days per week. These 'emergency skip days' are available just in case you need them to help you reach your weekly goal. If you cannot reach the number of steps 1 or 2 days, you can use one of your optional "emergency skip" days. These emergency skips do not roll over to the next week if you do not use them. You also do not have to use them; they are optional, available just in case you need them." Participants in the Reserve-Monthly Condition were told, "You have 8 optional 'emergency skip' days per month. These 'emergency skip days' are available just in case you need them to help you reach your goal. If you cannot reach the number of steps, you can use your optional 'emergency skip' days. You do not have to use the 'emergency skip' days; they are optional, available just in case you need them."

Reserve participants received instructions on where the Google spreadsheet would track these emergency skips for them and how to apply their emergency skip. In order to apply their "emergency skip," participants had to click on the cell where they wanted to apply their "emergency skip" and then had to click on a red "Apply Emergency Skip" button. If they used an "emergency skip," a blue bar would emerge for that day. In designing how the Reserve would be used, we wanted to amplify participants' tendency to resist using their emergency skips by making the button red and terming it an "emergency" skip. However, once the emergency skip was used, we wanted Reserve participants to feel as if they had not failed to reach their step goal that day, thus reducing the negative consequences of sub-goal violation failure and increasing the chance of persistence. We accomplished this by making the graphical depiction of applying the Reserve after failing to reach the step goal the same as actually succeeding at the step goal for the day (a blue bar for that day). Participants would receive a warning message if they used more than their allocated emergency skips. If the participants continued to use more than their allowed

skips, the researcher emailed the participant to ask them to remove the excessive skips.

Participants were then asked the following questions on 7 point Likert Scale with *1= Not at all Likely* and *7= Very Likely*.

1) How committed do you feel to your goal?
2) How difficult do you think it will be to accomplish this goal?
3) How likely do you think it is that you will accomplish your goal?

Participants were informed they would still receive their payment even if they did not reach their weekly goal. For the next four weeks, they tracked their steps and recorded them on the Google spreadsheet. Participants' Google spreadsheets were randomly checked every few days to ensure that they were recording their steps on the Google spreadsheet. If participants did not record their steps on the Google Spreadsheet for over 2 days, they were warned they may not receive their $40 payment. If participants still continued to not update their Google Spreadsheet, they were eliminated from the study.

Third Phase

After four weeks, 246 remaining participants were asked to complete a final questionnaire. Participants were asked to refer to a calendar and to their Google Spreadsheets. On their Google Spreadsheet, they were asked to type a reason, such as had to study, event, tired, didn't feel like it, sick, don't know, etc., for why they failed their step goal above each failed day. In the Reserve conditions, participants were also asked to list reasons for why they used their emergency skips and to list the number of steps they took on the days that they used the skips. A research assistant blind to the hypotheses later coded these reasons.

Participants were then asked the following questions: Questions with * and parts of questions with [ ] were only asked from participants in the Reserve conditions.

1) Did you have any strategies for when you used your emergency skip days? If so, please describe it below. *
2) How committed were you to reaching your weekly goal?
3) Did you ever get discouraged about reaching your weekly goal?
4) How satisfied did you feel after failing to reach your step goal, **if you applied your emergency skip day**?*
5) How determined did you feel after failing to reach your step goal, **if you applied your emergency skip day**? *
6) How much guilt did failing to reach your step goal make you feel, **if you applied your emergency skip day**? *
7) How satisfied did you feel after failing to reach your step goal, [**if you could not/did not apply your emergency skip day**?]
8) How determined did you feel after failing to reach your step goal, [**if you could not/did not apply your emergency skip day**?]
9) How much guilt did failing to reach your step goal make you feel, [**if you could not/did not apply your emergency skip day**?]
10) How satisfied were you with your performance for each week? (for Week 1-Week 4)

11) How determined did you feel after each week to meet the weekly goal the following week? (for Week 1-Week 4)
12) How much did your performance each week make you feel guilt? (for Week 1- Week 4)
13) Overall, how satisfied are you with your performance across all 4 weeks?
14) Did you feel any guilt applying your "emergency skip" days?*
15) How difficult was it for you to complete your weekly goal each week?
16) How motivated were you to complete your weekly goal each week?
17) Did you give up at any point to reach your weekly goal?
    a. Why?
18) Do you plan on continuing to use the Pacer app?
19) Would you sign up for this study again in the future?
20) Would you recommend the weekly goal you had to a friend?
21) Imagine when you were asked to sign up for this study you could have chosen your weekly goal (with the same step goal). Which goal would you have chosen from below? (You can choose your same goal from the study or you can choose a different goal)
    a. Reach your step goal 5 days of the week, Reach your step goal 7 days of the week
    b. You also have 2 optional "emergency skip" days each week just in case you need them to help you reach your goal. If you cannot reach the number of steps, you can use the optional "emergency skip" days. These emergency skips do not roll over to the next week if you do not use them
    c. Reach your step goal 7 days of the week. You also have 8 optional "emergency skip" days throughout the 4 weeks just in case you need them to help you reach your goal. If you cannot reach the number of steps, you can use the optional "emergency skip" days
    d. Reach your step goal 7 days of the week
22) Why would you make this choice?
23) If you had the same weekly goal but could choose how many emergency skip days you had, would you change the number of emergency skip days you had?*
24) How many would you have (total)?*
25) How physically fit do you feel relative to when you first started the task?
26) Please enter your weight (in pounds) today.
27) Were you on vacation during any part of this study (including the baseline week)?
28) What were the dates that you were on vacation?
29) What percent of your exercise do you think was recorded with the Pacer app?
30) Did you engage in other types of exercise?
31) How many minutes per week did you engage in these activities?

Participants also completed the Brief Self-Control measure, the Propensity-to-Plan scale for short-term time, a brief measure of personality, and a measure of satisficing behavior.