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Motivational Goal Bracketing: An Experiment

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Abstract

We study in an online, real-effort experiment how the bracketing of non-binding goals affects performance in a work-leisure self-control problem. We externally induce the goal bracket – daily goals or a weekly goal – and within that bracket let subjects set goals for how much they want to work over a one-week period. Our theoretical model predicts (i) that weekly goals create incentives to compensate for a lower than desired performance today with the promise to work harder tomorrow, whereas daily goals exclude such excuses; (ii) that subjects with daily goals set higher goals in aggregate and work harder than those with weekly goals. Our data support these predictions. Surprisingly, however, when goals are combined with an externally enforced commitment that requires subjects to spend less than a minute each day on the task to get started working, performance deteriorates because of high dropout rates from the task.

JEL Classification: D03, D81, D91

Keywords: Self-control, goals, narrow bracketing, commitment devices, real effort, online experiment

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1 Introduction

Decades of research in psychology document that personal goals play an important role in helping to overcome motivational problems (e.g., Locke and Latham 1990, 2002). Yet, it is still poorly understood how the bracketing of goals matters. For example, taxi drivers often appear to set narrowly bracketed goals corresponding to a daily income target (Camerer et al. 1997, Dupas and Robinson 2016). At first glance, this is puzzling. By taking it 'one day at a time', taxi drivers forgo gains in earnings and leisure that they could realize, for example, with a weekly goal. Such a broadly bracketed goal would allow them to work fewer hours on days with low hourly earnings by compensating with more hours on days with high hourly earnings. The reason that taxi drivers nevertheless bracket their goals narrowly is that doing so helps them exercise self-control as Read et al. (1999, p.189) argue: "If [taxi drivers] had, for example, picked a weekly target they might have been tempted to quit early on any given day, while assuring themselves that they could make up the deficiency later in the week."

We employ a series of online experiments and a theoretical model to make four main contributions. First, we study goal setting in repeated tasks and thereby extend on previous work (Koch and Nafziger, 2016). Second, we analyze how people actually set and design goals by running an online, real-effort experiment with students. We show that daily goals are better for motivating people than weekly goals – in line with the suggestive example of the taxi drivers and the predictions of our theoretical model. Third, we examine the mechanisms for why broad goals motivate less than narrow goals. We confirm the prediction of our theoretical model that subjects with daily goals set higher goals in aggregate than those with weekly goals. Because higher goals motivate more, subjects work harder with daily goals than with a weekly goal. Further, theory predicts that broad goals prompt people to engage in 'effort substitution': they put in low effort today and compensate with higher effort later on. In line with this, we find that subjects with weekly goals are more prone to delay work than with daily goals, and that daily goals help subjects to regularly get started on the task. Fourth, we investigate whether internal commitment from goal setting can be enhanced by an externally enforced commitment device. The commitment device is a minimum work requirement, under which individuals are required to spend less than a minute every day to get started on the task, but otherwise are allowed to freely choose their effort over time. Surprisingly, we observe that even such weak external commitment leads to substantial dropout from the task and harms overall performance. Thus, overall, our results suggest that a strong internal commitment device (a narrow goal) without additional external commitment is in fact best for motivating individuals.

In our online experiment, student subjects are informed of an opportunity to earn money in a real-effort task from Monday to Friday in the following week. The experiment mimics a typical work-leisure self-control problem. Work is desirable (the piece-rate pay is generous) but the task requires effort and is tedious (counting the number of zeros in up to 1000 tables with zeros and ones). Our study neither requires subjects to show up at a lab nor to obey a particular schedule. Thus, they face the usual real-life temptations from leisure as an alternative to work. In our main treatments, half of the subjects are randomly assigned to set a broad goal for the week (treatment *Weekly*) and the other half to set a narrow goal for each weekday (treatment *Daily*). That is, we externally induce the goal bracket (narrow or broad) and then let people choose their goals, which are non-binding. In the following week, each weekday at midnight, subjects receive an email reminder of their goal for the day, or of their goal for the week. Subjects can then freely choose when and how much to work on the task.

We observe, across subjects, that subjects set higher aggregated daily goals than weekly goals. And they work harder with daily goals than with weekly goals. Yet, this latter effect disappears when we control for the goal level. Indeed, the theory predicts a lower goal in *Weekly* compared to the aggregated daily goals in *Daily* because (i) the individual dislikes an asymmetrical distribution of effort over the work days caused by effort substitution, and (ii) a lower goal results in a less skewed effort profile if the marginal utility is convex. So one possible interpretation of the experimental result is that the higher performance with daily goals stems from the higher goals that subjects set. Subjects in *Weekly* indeed may anticipate the problem of effort substitution and set lower goals so that they do not later in the week need to make up for their low effort in the beginning of the week.

To test cleanly for effort substitution, we conduct an additional treatment that allows to compare effort levels with *Daily.* All subjects set daily goals. After this, half of the subjects are randomly assigned to treatment *Daily* where they receive feedback about their daily goals in their daily reminder. The other half of the subjects are assigned to treatment *DailyAggregated*, where in their daily reminder they receive feedback about their weekly goal (the sum of their daily goals). After confirming that the goal feedback frame is successful and that goals do not differ significantly between these two treatments, we observe that efforts do not differ significantly between them. This result is in line with the interpretation given above that the effort gap in *Daily* versus *Weekly* is related to the lower total goal for the week in *Weekly* compared to *Daily* and in line with our theoretical model, which predicts that people achieve their goals. Most importantly, theory predicts that effort substitution causes work patterns over the week to differ between *Daily* and *DailyAggregated*, which is what we find: subjects in *DailyAggregated* work less in the beginning of the week than subjects in *Daily*; and they work more in the end of the week to make up for the shortfall and still meet the same total goal for the week.

We also implement a treatment where we do not ask subjects to set goals (yet, we cannot control for private goal setting). While the effects go in the right direction (subjects work more with goals than without), the differences are not significant. We explore the possible mechanisms behind this result. Consistent with the previous literature, we find that goals work well for men and high productivity individuals, but that they have no or even adverse effects on women or low productivity individuals.

To examine whether the positive effect of daily goals stems from their superior ability to get people started working, we run additional treatments which complement goals with a weak external commitment device that requires subjects to count at least one table per day to receive any payment from the real effort task (treatments *DailyCommitment* and *WeeklyCommitment*). While this commitment device gives full flexibility how to allocate work and how much to work on each day, it forces subjects to 'get started' with the task each day, regardless of the way goals are bracketed. Comparing treatments *DailyCommitment* and *WeeklyCommitment*, we observe no significant difference in goal levels, effort levels, and effort patterns. This result is suggestive for the interpretation that once subjects are forced to 'get started' each day (by counting one table), they also 'get finished', so that problems of low effort provision disappear.

Finally, we investigate how this external commitment device interacts with the internal commitment device of goal setting. Surprisingly, the comparison of treatments *Daily* and

DailyCommitment reveals that subjects on average work *less* when they are forced to solve one table per day. Exploring the driving forces behind this result, we find that it can be explained by a large fraction of subjects who drop out when they face the external commitment device. Once we look at those subjects who do not drop out, performance does not differ between *Daily* and *DailyCommitment*, consistent with the interpretation that narrow goals already are good at getting people started. The pattern is reversed for broad goals. For those who do not drop out, effort is much higher in *WeeklyCommitment* than in *Weekly* – as one would expect if the commitment device gets people started working. But due to the increased drop out overall the effort is not significantly different between the two treatments.

Together these results suggest two conclusions. First, when people use only a 'weak' internal commitment device (a broad weekly goal), adding external commitment has two effects that offset each other: While dropout increases, the commitment does help those who do not drop out to avoid effort substitution and thereby increases their performance enough to compensate for the rise in drop out. Yet, with a 'strong' internal commitment device (narrow daily goals), adding external commitment causes harm because dropout increases but there is no boost in performance of those who do not drop out. Second, much of the motivational problem in this repeated work setting seems to be about 'getting started'. Once people get started with the task, they seem to stay with it. And once people get started every day, the problem of effort substitution disappears.

Related literature. The narrow bracketing literature goes back to Tversky and Kahneman (1981). Much of the literature considers narrow bracketing of simultaneous risky choices. In such situations, narrow bracketing is a choice error (Rabin and Weizsäcker, 2009). But there is also a literature strand that considers narrow bracketing as a tool to overcome self-control problems (Shefrin and Thaler, 1988; Heath and Soll, 1996; Fudenberg and Levine, 2006; Koch and Nafziger, 2016; Hsiaw, 2017). In this paper, we deal with such motivational bracketing, not with choice bracketing.

By studying goals and goal brackets, this paper contributes to the literature on commitment devices for overcoming motivational problems. Most of these studies focus on external commitment devices (for an overview see Bryan et al., 2010). Of these studies, the ones considering effort decisions are most closely related to our study.[1] Ariely and Wertenbroch (2002) observe that imposing binding deadlines on students improves their performance. Bisin and Hyndman (2014) and Burger et al. (2011) however find no such effects. In Kaur et al. (2015), workers can set individual work targets that are then externally enforced by the firm.

In contrast to these studies, we consider an *internal* commitment device – namely non-binding goals. The vast psychology literature on goals mostly investigates the effect of goals that are exogenously assigned by an experimenter (for an overview see Locke and Latham, 1990). A recent literature in economics investigates theoretically how people set and design goals for themselves. In the models of Suvorov and van de Ven (2008), Koch and Nafziger (2011), and Hsiaw (2013), goals help to overcome self-control problems by serving as reference points that make substandard performance psychologically painful. Hsiaw (2017) and Koch and Nafziger (2016) theoretically investigate whether and why people set narrow or broad goals in simultaneous tasks (the latter) and in optimal stopping problems (the former).

A growing number of experimental studies in economics consider how people set goals for themselves and how such self-set goals affect task performance. While we also examine the motivational power of goals (vs. no goals), our contribution is to provide the first experimental evidence on how the bracketing of goals – narrow versus broad – affects their motivational power. Akina and Karagozoglub (2017) examine the impact of self-set goals and observe that they have no effect on performance. In contrast, Smithers (2015) finds that self-set goals increase performance – more so for men than for women. van Lent and Souverijn (2017) also observe a positive effect of goals on performance in a field experiment where students set grade goals. Clark et al. (2016) compare effort versus output goals and observe that only effort goals have a positive impact on the performance of students. Using field data from marathons, Allen et al. (2016) provide evidence that runners adjust their performance to meet round number time goals (like running a four-hour marathon), leading to a bunching of completion times around round numbers. Using observed food menu choices Toussaert (2016) develops a revealed preference measure of temptation. She observes that

[1] Giné et al. (2010) and Ashraf et al. (2006) consider different contexts. The former examines the effects of a commitment contract for smokers. The latter studies the effects of a commitment savings product in the Philippines.

this measure is predictive in another domain (a weight-loss challenge) of the goals set, but not of achieving the goal.

Other studies tie monetary incentives to goals. Goerg and Kube (2012) examine in a field experiment how self-set and exogenously assigned goals affect performance, and whether goals are more effective if they are tied to a monetary bonus. They find that self-set goals that are tied to a monetary bonus are most effective, but even without monetary incentives goals increase motivation. In lab experiments, Corgnet et al. (2016), Corgnet et al. (2015) and Dalton et al. (2015) examine how managers combine non-binding goals and monetary goals to motivate workers.

By studying the interaction between internal and external commitment devices our study is related to Bénabou and Tirole (2004). Their model can explain why people do not abandon unpleasant personal rules, i.e., why internal commitment devices actually work. By sticking to personal rules, the individual builds up self-reputation over his willpower. They show that external control might be good because it commits the individual to provide a certain effort, but bad because it undermines self-reputation. We contribute to this literature by pointing to another disadvantage of externally induced commitment: dropout.

2 Theory

Our theoretical predictions are based on a setting where a quasi-hyperbolic discounter (Laibson, 1997) works on a repeated task. The model extends a version of Koch and Nafziger (2016) to sequential tasks. An individual performs the same task at T different dates $t \in \{1, \dots, T\}$. The activity is a so-called virtue or investment activity, that requires effort $e_t \in [0, \infty)$ which leads to immediate costs $c(e_t)$ (strictly increasing and convex) and long-run benefits $b(e_t)$ (strictly increasing and concave). To ensure interior solutions, we assume that $b''(e) - c''(e) < 0$.

The utility of self t, the incarnation of the individual at date $t \in \{0, 1, \dots, T+1\}$, is

$$U_t = u_t + \beta \left[\sum_{\tau=t+1}^{T+1} u_\tau \right],$$

where u_t is the instantaneous utility, given by (in the absence of goals): $u_0 = 0$, $u_t = -c(e_t)$ for $t \in \{1, \dots, T\}$ and $u_{T+1} = \sum_{t=1}^{T} b(e_t)$. That is, costs of effort are immediate, while consumption occurs after all work is completed (in the experiment, payments are delayed). The parameter $\beta \in (0, 1)$ is the present bias of the individual and captures the extent to which the individual overemphasizes immediate utility flows relative to more distant utility flows. The standard exponential discount factor δ is normalized to one.

In the absence of goals, the present bias causes an intra-personal conflict of interest. For future selves, the immediate costs of effort loom larger than they do for self 0: future selves discount the future costs by the present-bias factor $\beta < 1$, while self 0 weights equally future costs and benefits. Specifically, self 0 would prefer effort to equate marginal costs and benefits from his perspective, that is

$$b'(e_0^*) = c'(e_0^*). \tag{1}$$

In contrast, self t chooses effort so that

$$\beta\, b'(e_t^*) = c'(e_t^*). \tag{2}$$

As $\beta < 1$, we have $e_0^* > e_t^*$. That is, the individual faces a work-leisure self-control problem: self 0 wants a higher effort than self t actually provides. To overcome this intra-personal conflict of interest, self 0 sets effort goals. Depending on the treatment, this is either a narrow goal g_t for each day $t \in \{1, \ldots, T\}$, or a broad goal, G for the sum of effort over all days. With narrow goals, the individual compares the actual effort e_t with the goal g_t. With a broad goal, the individual compares the overall effort $\sum_{t=1}^{T} e_t$ with the broad goal G. If the effort differs from its goal by z, the corresponding comparison utility is $\mu(z) = z$ for $z < 0$, i.e. for falling short of the goal, and it is $\mu(z) = 0$ for $z \geq 0$.[2] The individual experiences the comparison utility in the last period. That is, with a broad goal we have $u_{T+1} = \sum_{t=1}^{T} b(e_t) + \min\{0, \sum_{t=1}^{T} e_t - G\}$ and with narrow goals we have $u_{T+1} = \sum_{t=1}^{T} (b(e_t) + \min\{0, e_t - g_t\})$.[3]

[2] Koch and Nafziger (2016) build on Kőszegi and Rabin (2006) and assume that an effort goal induces reference standards for the different outcome dimensions (costs and benefits). The individual compares, for each dimension separately, the actual outcome with the expected outcome. We simplify and define comparison utility over the effort dimension because this corresponds to the frame of the experiment.

[3] The assumption that comparison utility is experienced in the last period is discussed in Koch and Nafziger (2016). Specifically, relaxing it would imply that individuals evaluate their broad goals later than their narrow goals (at the end of the week vs. at the end of each day). This creates an additional negative incentive effect under broad goals.

We derive results under two assumptions. First, we assume that goals are rational. This means that the actual effort equals the goal, i.e., $e_t = g_t$ (for narrow goals) and $\sum_{t=1}^{T} e_t = G$ (for a broad goal). And second, we assume that the individual is sophisticated (O'Donoghue and Rabin, 1999), i.e., knows about his present-biased preferences.

2.1 Narrow goals

What effort levels can self 0 induce with narrow goals? Or, put differently, when does his future self who works on task t have no incentive to deviate from the goal g_t? If the individual sticks to or even works harder than called for by the goal, the utility of self t is $\beta\, b(e_t) - c(e_t)$. If the individual deviates from the goal and effort falls short of the goal, he suffers a psychological loss. The fear of a loss makes the self t strive harder than he would without a goal. Specifically, the utility after a deviation $e_t < g_t$ is:

$$\beta\, b(e_t) - c(e_t) - \beta\,(g_t - e_t). \tag{3}$$

For a goal to be implementable, the utility from sticking to the goal has to exceed the utility from falling short of it. That is, (3) has to be increasing in e_t for any $e_t < g_t$. This is the case for any goal that is not 'too high', i.e., that does not exceed e_{max} defined by

$$\beta\ [b'(e_{max}) + 1] = c'(e_{max}). \tag{4}$$

Note that (2) and (4) imply $e_{max} > e_t^*$: That is, self t can be motivated to provide a higher effort than he would choose in the absence of a goal.

Self 0 picks his goals for tasks $t = 1, \ldots, T$ to maximize his utility $\beta\,[b(e_t) - c(e_t)]$ subject to $e_t \leq e_{max}$. That is, self 0 can fully overcome his self-control problem whenever $e_0^* \leq e_{max}$, where e_0^* is defined by (1). The larger the present-bias parameter β, the more likely this holds. In contrast, setting no goal means that self t chooses e_t^* defined by (2).

Proposition 1 *For β large enough, self 0 can fully overcome his self-control problem with a narrow goal and implement his desired effort e_0^* on each date. The individual provides strictly less effort without goals than with goals: $e_t^* < \min\{e_0^*, e_{max}\}$.*

To illustrate, a simple parametric example with $b(e) = e$ and $c(e) = \frac{1}{2}\,e^2$ yields $e_0^* = 1$, $e_1^* = \beta$, and $e_{max} = 2\,\beta$. Hence, for $\beta \geq \frac{1}{2}$ self 0 can implement his desired effort $e_0^* \leq e_{max}$.

Augenblick et al. (2015) estimate a population present bias parameter of $\beta = 0.9$. Some of our subjects participated in a prior study where we implemented the elicitation task of Augenblick et al. (2015), and we estimate a population β of 0.73. Compared to Augenblick et al. (2015), we however have more subjects who make non-monotonic choices (see section 4.4). If we restrict our sample to those subjects whose choices were monotonic (allowing for small mistakes), we estimate a population β of 0.91. Thus, we consider as the lead case that self 0 can implement his desired effort with narrow goals.

2.2 Broad goals

Broad goals can never improve self-regulation relative to narrow goals. The incentives to deviate from the goal in a single task are the same under broad and narrow goals. But broad goals can harm self-regulation, because self 0 also has to make sure that self 1 has no profitable 'joint' deviation from the goal, such as lowering effort today and compensating by increasing effort tomorrow. We refer to such behavior as 'effort substitution'. The next result shows that effort substitution prevents self 0 from implementing his desired daily effort e_0^* in each period with a broad goal, except in the special case where $e_0^* = e_{max}$. In the latter case he is committed not to engage in effort substitution because future effort never will exceed e_{max}.

Proposition 2 *Suppose e_0^* is implementable in each period with a narrow goal, i.e. $e_0^* < e_{max}$. Effort e_0^* is not implementable in each period with the broad goal $G = T\, e_0^*$.*

To provide some intuition for the proof in the appendix, suppose self 0 sets a broad goal $G = T\, e_0^*$ and $e_0^* < e_{max}$. Further, suppose that all selves stick to putting in e_0^*, except that self $T-1$ works less hard than e_0^*. Then the individual would suffer a loss from falling short of the broad goal. To avoid this loss, self T will make up for the shortfall created by self $T-1$ and increase his effort up to e_{max} so as to satisfy the broad goal. Anticipating this compensating behavior by self T, it indeed pays off for self $T-1$ to work less than e_0^* because the present bias makes self $T-1$ prefer (on the margin) to shift effort costs into the future. The following proposition characterizes the effort profile that results when facing the broad goal $G = T\, e_0^*$:

Proposition 3 *Suppose e_0^* is implementable in each period with a narrow goal, i.e. $e_0^* < e_{max}$, and the individual faces the broad goal $G = T\, e_0^*$. Then effort levels satisfy $e_1 < e_2 \leq e_3 \leq \cdots \leq e_T \leq e_{max}$, where $e_1 < e_0^*$ and $e_T > e_0^*$. Inequalities are strict if $e_t \neq e_{max}$. Overall, the individual achieves his goal: $\sum_{t=1}^{T} e_t = T\, e_0^* = G$.*

We can characterize the broad goal and the resulting effort pattern that the individual would optimally choose when facing a mild self-control problem (where $e_0^* < e_{max}$) if we impose a technical assumption on the third derivatives of the benefit and cost functions, which is for example satisfied if they are quadratic:

Proposition 4 *Suppose $e_0^* < e_{max}$, $\beta\, b'''(e) - c'''(e) \geq 0$, and $b'''(e) - c'''(e) \geq 0$. For β large enough, the individual sets a broad goal that falls short of the sum of desired effort levels of self 0, i.e., $G^* = \sum_{t=1}^{T} e_t < T\, e_0^*$. The effort levels satisfy $e_1 < e_2 < \cdots < e_T < e_{max}$, where $e_{T-1} < e_0^*$ and $e_T > e_0^*$.*

Self 0 could set a broad goal of reaching the sum of desired daily effort levels, e_0^*, and achieve the same overall effort as with narrow goals. In contrast to narrow goals, however, effort would be very asymmetrically allocated over the days because of effort substitution, and on no day would the effort be equal to the desired effort of self 0. Self 0 does better by setting a lower broad goal, as it results in a less skewed effort profile because of the convexity of marginal utility.

3 Experimental Design and Procedures

In this section we describe the experiment. In section 4, we reformulate the theoretical predictions above in terms of our experimental design and present the findings from the experiment.

Recruitment. We conduct the study at Aarhus University, Denmark. The study either is administered through a larger online study, for which subjects were recruited through an email call to all first-year students at the faculty of Business and Social Sciences (treatments *Weekly*, *Daily*, *WeeklyCommitment* and *DailyCommitment*) or through the subject pool of the Cognition and Behavior Lab at Aarhus University (treatments *Daily(R)*, *DailyAggregated*

0	0	0	1	1
0	0	0	0	0
0	0	1	0	1
0	0	0	0	0
1	0	0	1	0
0	1	1	0	1

Figure 1: Task: count the number of zeros in tables like this one.

and *NoGoal*) – see table 1 for an overview. Subjects receive an email with the survey link that provides the participant information and asks for consent. In total, 468 subjects participated. In the following, we discuss treatments *Weekly*, *Daily*, *Daily(R)*, *DailyAggregated* and *NoGoal*. Treatments *WeeklyCommitment* and *DailyCommitment* will be discussed in sections 4.4.4/5.

Design and Treatments. Each treatment consists of a goal setting part and a work part. (Instructions are in the appendix.)

Goal setting part. On a Wednesday at midnight subjects receive an email informing them that they can earn up to 500 DKK (about 83 USD) by completing a short online questionnaire before Friday midnight and performing some online tasks in the following week from Monday to Friday. A reminder is sent out on Friday 9am to those who have not yet responded.
In all treatments, the online questionnaire asks subjects to complete a task based on Abeler et al. (2011), or reminds them of the task if they are already familiar with it.[4] The task requires them to count correctly the number of zeros in a series of tables with zeros and ones (see figure 1). They have three minutes to count as many tables as possible and earn 0.5 DKK (about 0.08 USD) per correctly counted table. If they miscount a table, the table appears again on the screen. There is no punishment for miscounting. The task and payment structure are explained to subjects before they start counting. This provides us with a baseline *productivity* measure.

[4]For those who are recruited from a previous online study (see table 1), this part took place within that study which was conducted a few weeks before. Yet, these subjects do receive a reminder about the task with the online questionnaire. Those who are recruited from the lab subject pool conduct this task when completing the online questionnaire.

Table 1: Overview of treatments.

Treatment	Goal setting	Goal feedback[b]	Min. work requir.[d]	N Invited	N Partic.	Session time period[a] 1	2	3	4	5	6	7	8
1a Daily[c]	daily	daily	no	95	78	37	26				15		
1b Daily(R)[c]	daily	daily	no	80	75							75	
2 Weekly	weekly	weekly	no	96	77	35	25				17		
3 DailyCommitment	daily	daily	yes	57	47			26	12	9			
4 WeeklyCommitment	weekly	weekly	yes	55	45			27	11	7			
5 DailyAggregated	daily	weekly	no	80	75							75	
6 NoGoal	no goals asked		no	80	71								71
All					468								

Notes. [a]Recruitment: Periods 1-6 – first year students in Business and Social Science study programs at Aarhus University who participated in a prior online study; periods 7&8 subject pool of the Cognition and Behavior Lab at Aarhus University one year later. [b]In all treatments, subjects got daily reminders by email. The treatment difference is whether the reminder is about a daily or a weekly goal. [c]*Daily(R)* is a replication of *Daily*. [d] Requirement to count at least one table per day.

After this stage, subjects receive the information that they can count up to 1,000 such tables at any point during the following week from Monday to Friday, and that they receive 0.5 DKR per correctly counted table. Further, subjects are informed that they will receive each day an email with a personal link. Following this link allows them to count tables.

In all treatments, except the *NoGoals* treatment which directly moves to the final screen, subjects then face some questions that make them think more deeply about the benefits of working on the task and their work week ahead: they consider how much time they can spend on the task in the following week, what they can realistically earn, and what they would like to do with that money.

After moving to the next page, depending on the treatment they are assigned to, subjects set non-binding goals using slider bars. Table 1 gives an overview of the different treatments. In treatments *Daily* and *DailyAggregated* subjects set a separate daily goal for how many tables to count for each day of the following week (adding up to at most 1000 tables for the entire week). In treatment *Weekly* they set a weekly goal between 0 and 1000 tables for the number of tables to count Monday to Friday. When setting goals, subjects know that we will remind them of their goals next week. Yet, we do not mention the way goals are bracketed in the reminders. The final screen states that subjects will receive an email at 0:00h on Monday with a link to the work task.

Work part. In the following week, each week day at 0:00h, subjects receive an email informing them about the goal they set for that day (*Daily*) or for the week (*Weekly*). In *DailyAggregated*, we aggregate the daily goals into a weekly goal and provide feedback about this weekly goal.

Further, the email provides the link to the work task, and reminds subjects that they can use this link anytime between now and Friday 23:59h. The link leads to a work screen with the first table to be counted. The layout only differs across treatments in the first two lines that are shown above the table. In *Daily*, these lines show the goal for the current day and how many tables the subject has already counted on that day. In *Weekly* and *DailyAggregated*, these lines show the weekly goal and how many tables the subject has already counted in total. In treatment *NoGoal*, these lines are absent. The next lines always show the number of remaining tables that still can be counted out of the 1,000 tables, a reminder about the earnings, and that subjects can use the link to come back as often as they like.

Each time a subject completes a table, a new table appears and the screen information is updated. If someone miscounts, the same table is presented again. Upon reaching the maximum of 1,000 tables, a thank you screen appears and no further counting is possible.

Our design aims to create a work-leisure self-control problem. It features generous pay, which should make it ex ante desirable for the typical subject to complete the tasks. But once a subject faces the task, its tedious nature should make the leisure alternative tempting. Specifically, completing all 1,000 tables required about 2-3 hours of work. Our pay of 500 DKK for that time is substantially above the usual hourly wage for students of around 130 DKK per hour.

By comparing treatments *Daily* and *Weekly* we can examine the overall effect of the goal format on goals and effort. Yet, as the goal is endogenous, we can only partly conclude (by controlling for the goal in the effort regressions) whether a higher effort is caused by the treatment (goal bracket) or by the different goals which different treatments induce. To examine the effect of the goal bracket while controlling for the goal level, we compare *DailyAggregated* with *Daily*. All subjects set daily goals. After they set goals, they are randomized into either treatment *Daily*, which has reminders of the respective daily goal via email and on the work screen, or treatment *DailyAggregated*, which aggregates the daily goals into a weekly goal and shows the aggregated, weekly goal in the email reminder and on the work screen. In both treatments the reminder is sent out daily. At the goal setting stage, subjects know that they will be reminded of their goals in the next week but are not yet made aware of the specific format. Thus, if this frame is successful (which we confirm in section 4.2), comparing treatments *Daily* and *DailyAggregated* gives the impact of the bracket for goal feedback (weekly vs. daily goal) on effort.[5]

Treatment *NoGoal* differs from the other treatments in that subjects do not fill out the short questionnaire about their plans and goals, i.e., they were not encouraged to set goals. But of course, the announcement of the task and time frame itself might prompt subjects to plan and set private goals. We cannot control for such self-set goals in treatment *NoGoal*. Subjects receive daily emails with the link to the task.

Procedures. Subjects are informed that payments will be made 2-6 weeks after the experiment by bank transfer via the Danish payment system through which public bodies and companies can send money to a person using their social security number.[6]

The experiment runs online using the Qualtrics survey software, allowing subjects to switch between English and Danish instructions. Subjects can use their own desktop, notebook, or touch-pad computer but not a smart phone (a software filter prevented access with the latter). The reason for preventing the use of smart phones stems from the idea that subjects should bear effort costs – with a smart phone people can just solve a bit of the task here and there (e.g., while waiting for the bus), which might not be perceived as costly. Moreover, tables were copy protected to prevent subjects from copying them into a spreadsheet program to do the counting for them.

[5]As treatment *DailyAggregated* takes place one year after treatment *Daily* and used a different subject pool, we refer to the replicated treatment *Daily* as *Daily(R)* whenever the distinction is relevant.

[6]This payment method is required by Aarhus University to comply with the tax code. The procedure is standard and perceived as normal by Danish citizens.

4 Goal Setting and Effort Behavior

In this section, we present descriptive statistics from the experiment and analyze goal setting and effort behavior. We summarize the predictions, derived from the theoretical model in section 2, and contrast them with the experimental findings using regression analysis, including gender and productivity as controls. For the main results, we report the regressions also without these controls. In the text, we also report effect sizes (Cohen's d) for our main results. We speak of $d < 0.2$ as no effect, $d \in [0.2, 0.5)$ as a small, but non-negligible effect, $d \in [0.5, 0.8)$ as a medium effect and $d \geq 0.8$ as a large effect.

We performed power calculations only ex-post. For a two-sided t-test with $p = 0.05$ (0.1), an effect size of 0.4 and $N = 75$ subjects, we would get a power of 0.68 (0.78). That is, there is a 68 (78) percent chance that we reject the null hypothesis of no treatment difference when the null indeed is false. That is, our study is slightly underpowered for $p = 0.05$, while with $p = 0.1$ it is correctly powered.

4.1 Descriptive Statistics

Table 2 provides descriptive statistics for goals set and tables counted, as well as for the control variables gender and productivity. Henceforth, we refer to the number of correctly counted tables simply as counted tables (the number of attempted tables is strongly correlated). There is no overall significant difference across treatments in gender composition (Fisher's exact test, $p = 0.33$) and pairwise tests fail to detect differences – except for treatments *Daily(R)* vs. *DailyAggregated*. Similarly, productivity, as measured by the number of tables counted in a 3-minute interval in the beginning of the study, does not differ across treatments (Mann-Whitney tests) – except for *Daily* vs. *Daily(R)* that ran in different years on different subject pools.[7]

About half of the subjects reach or surpass their goal. While we assumed in the theoretical model that goals are rational, i.e., that individuals achieve them, such non-achievement could

[7] *Daily* vs. *Weekly*: Gender $p = 0.42$/productivity $p = 0.64$; *Daily(R)* vs. *NoGoal*: $p = 0.32/p = 0.76$; *Daily* vs. *Daily(R)*: $p = 0.42/p = 0.08$; *Daily(R)* vs. *DailyAggregated*: $p = 0.05/p = 0.23$; *DailyCommitment* vs. *WeeklyCommitment*: $p = 0.83/p = 0.55$; *Daily* vs. *DailyCommitment*: $p = 0.85/p = 0.23$; *Weekly* vs. *WeeklyCommitment*: $p = 0.26/p = 0.99$.

Table 2: Descriptive statistics for goals set and tables counted.

Treatments	N	Average goal						Fraction of subjects
		Total	Mon	Tue	Wed	Thu	Fri	with goal=1000
1a Daily	78	789	181	145	148	183	132	0.51
1b Daily(R)[a]	75	796	178	165	151	156	146	0.41
2 Weekly	77	682						0.47
3 DailyCommitment	47	858	199	157	167	178	157	0.53
4 WeeklyCommitment	45	750						0.53
5 DailyAggregated	75	791	197	160	164	138	132	0.48

		Average no. of tables counted						Fraction of subjects with count		Female	
		Total	Mon	Tue	Wed	Thu	Fri	=1000	<goal		Productivity
1a Daily	78	690	216	156	108	104	105	0.41	0.45	0.58	16.77
1b Daily(R)	75	572	200	138	100	65	69	0.43	0.53	0.51	15.67
2 Weekly	77	521	168	119	101	63	70	0.30	0.47	0.51	16.43
3 DailyCommitment	47	487	195	97	87	68	39	0.36	0.60	0.60	15.72
4 WeeklyCommitment	45	558	162	119	145	81	51	0.42	0.40	0.62	16.09
5 DailyAggregated	75	649	154	156	110	108	120	0.43	0.39	0.68	16.41
6 NoGoal	71	581	134	151	117	87	92	0.41		0.60	15.56

Notes. [a] *Daily(R)* is a replication of *Daily* to run in parallel with *DailyAggregated*.

reflect that effort or opportunity costs are stochastic and unknown at date 0. However, and most importantly for the interpretation of treatment differences, logit regressions reveal that there is no effect of treatment on the likelihood of reaching or surpassing the goal (see table 11 in the appendix).

The data show that completing the task appears to be attractive, as roughly half the subjects in all treatments choose a goal of completing all 1,000 tables; and between 30 and 43 percent of subjects count all 1,000 tables. A common way of dealing with such censoring is to employ tobit regressions, which we do in the following. Yet, a concern with that approach is that our data violate the normality assumption of the tobit model. We therefore ensure robustness by also running symmetrically censored least squares (SCSL) regressions (Powell, 1984) that are robust to specification problems of the tobit model (see the appendix, which also reports OLS regressions). Further, logit regressions reveal that there is no effect of the treatment on the likelihood of a censored total goal (weekly goal=1000 or sum of daily goals=1000) or a censored work performance (total count=1000) (see tables 12 and 13 in the appendix). This indicates that censoring does not drive our main insights.

4.2 Daily vs. Weekly Goals

Predictions. In *Daily* and *DailyAggregated*, by construction, subjects should set (on average) the same goals. Henceforth, we refer to the aggregate goal for the week as *total goal*. Indeed, we observe no treatment effect on the total goal, and the effect size is close to zero ($d = 0.02$). That is, randomization into treatments, which occurred after goals were set, appears to have been successful (cf. table 14 in the appendix).

The treatment difference is that in *DailyAggregated* we aggregate daily goals and provide feedback in the form of the total goal for the week. We assume that the goal feedback, in the form of the aggregated weekly goal, and not the initial exercise of setting daily goals defines how the subjects bracket their goals in treatment *DailyAggregated*. If this assumption is satisfied, daily goals should be significant predictors of daily effort with the daily goal feedback format (*Daily*) but not with the weekly goal feedback format (*DailyAggregated*). Indeed, this is what we find (see table 14 in the appendix). That is, the framing of goal feedback seems to have been successful.

Thus, the comparison of *Daily* and *DailyAggregated* shows the impact of the goal bracket – weekly vs. daily – on effort. According to proposition 3, subjects in *DailyAggregated* should work less during the beginning of the week than subjects in *Daily*, but more towards the end of the week. Because the sum of daily goals, henceforth simply referred to as the total goal, is the same in *Daily* and *DailyAggregated*, total effort should be the same.

Treatment *Weekly* captures in addition the effect of a weekly bracket on goal setting. Based on proposition 4, we predict a lower total effort and a lower total goal than in *Daily*. As above, subjects in *Weekly* should work less during the beginning of the week than subjects in *Daily*, but more towards the end of the week.

Goal setting. Table 3 shows the impact of the goal bracket on the goals that subjects set. As hypothesized, subjects set significantly higher goals in *Daily* than in *Weekly*, and the effect size is non-negligible ($d = 0.33$). The same pattern appears for the comparison of *DailyAggregated* (where subjects initially set daily goals) and *Weekly* ($d = 0.36$). In some of the specifications, the coefficient only becomes significant after controlling for gender and productivity – indicating that the coefficients are imprecisely estimated without the controls.

Effort. Table 4 shows the impact of the goal bracket on effort. Consistent with our hypothesis, people work significantly more in *Daily* than in *Weekly* ($d = 0.44$). Once we control for the total goal for the week, the coefficient becomes smaller and insignificant in some specifications. Thus, the effort gap between *Daily* and *Weekly* is related to the higher total goal in *Daily* compared to *Weekly*. Yet, the treatment difference remains sizeable even after controlling for the total goal. That is, we cannot rule out that daily goals on their own might be more motivating than weekly goals. One possible reason could be that partial naïveté leads people to overestimate the extent to which they make up tomorrow for a shortfall in effort today.

As hypothesized, we observe no significant difference in total effort between *Daily* and *DailyAggregated*, which is also confirmed by the low effect size ($d = 0.18$). Only the effort pattern over time should differ between *Daily* and *DailyAggregated*, to which we turn now.

Effort pattern over time. Figure 2 shows how the average daily effort evolves over the course of a week in the different treatments. Note that our theory predicts a constant (*Daily*)

Table 3: Impact of goal setting format on total goal.

Treatments	Daily vs. Weekly				DailyAggregated vs. Weekly	
	(1a & 2)		(1a, 1b, 2, & 5)		(2 & 5)	
	(1)	(2)	(3)	(4)	(5)	(6)
Daily goals[a]	150.95	173.14*	130.39*	155.08**	134.64	191.55**
	(96.82)	(89.37)	(73.77)	(69.65)	(89.13)	(84.90)
Productivity		24.17**		23.76***		24.77**
		(11.08)		(7.04)		(10.33)
Female		-417.57***		-250.02***		-316.93***
		(90.65)		(60.58)		(89.82)
Constant	866.26***	677.16***	840.72***	577.53***	846.59***	598.52***
	(78.33)	(184.81)	(68.92)	(127.31)	(74.07)	(173.36)
N	155	155	305	305	152	152

Notes. Dependent variable: Total goal. Tobit β-coefficient (marginal effect on the latent dependent variable) with robust standard error in parenthesis. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$. [a]Dummy for daily goal setting format (i.e., dummy for treatment being *Daily* or *DailyAggregated*; in the latter subjects also set daily goals and the feedback format is assigned only after goals are set).

or upward sloping effort pattern (*Weekly* and *DailyAggregated*). The figures show that this is not the case. In our model, we assumed that the marginal cost of effort does not vary over time. Yet, in reality, it might do so. Specifically, marginal costs might be higher at the end of the week because Thursdays and Fridays are typical days for student parties or pub nights, i.e., opportunity costs are higher. Such increasing marginal costs could explain the downward sloping pattern.

Further, the graphs give some feeling for the occurrence of effort substitution, and illustrate what we will confirm in the regressions. Subjects in *Weekly* work less in the beginning of the week than subjects in *Daily*, and there is no catching up later in the week. Similarly, subjects in *DailyAggregated* work less in the beginning of the week than subjects in *Daily*, but they make up for the shortfall by working harder later in the week.

Tables 5 and 6 summarize the regression results on effort substitution. Table 5 tests whether subjects who face daily goals work more on the first work day than subjects who set (or receive feedback about) weekly goals.[8] For the following days, Tuesday through Friday,

[8]We do not report SCSL regressions in the appendix because only 8 out of the 397 subjects in the

Table 4: Impact of goal and goal setting or feedback format on total effort.

Treatments	Daily vs. Weekly						Daily vs. DailyAggregated		
	(1a & 2)			(1a,1b, & 2)			(1b & 5)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Daily goals[a]	235.46**	228.39**	151.44*	170.08*	180.34**	81.00			
	(96.97)	(94.86)	(91.31)	(91.41)	(87.51)	(83.33)			
Daily goal feedback[b]							-108.26	-17.45	-37.37
							(132.05)	(130.91)	(122.85)
Total goal			0.60***			0.77***			1.07***
			(0.14)			(0.12)			(0.19)
Productivity		33.52***	24.49**		44.15***	34.10***		51.72***	38.69**
		(10.67)	(10.38)		(10.11)	(9.72)		(16.73)	(16.03)
Female		-93.66	53.56		-26.55	92.77		247.14*	299.74**
		(99.86)	(99.11)		(89.45)	(83.99)		(132.17)	(124.93)
Constant	611.57***	109.27	-230.05	627.33***	-84.75	-504.44***	856.74***	-166.93	-823.58***
	(71.05)	(176.97)	(168.23)	(74.16)	(173.44)	(166.23)	(96.52)	(311.69)	(309.98)
N	155	155	155	230	230	230	150	150	150

Notes. Dependent variable: Total effort (tables counted over all five days). Tobit β-coefficient (marginal effect on the latent dependent variable) with robust standard error in parenthesis. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. [a]Dummy for daily goal (i.e., dummy for treatment *Daily*). [b]Dummy for daily goal feedback format (i.e., dummy for treatment *Daily*).

effort may depend on the efforts on the previous days. We account for the dependencies with a tobit random effects panel regression model (Table 6). It shows the time trends in effort.

Looking at effort patterns in *Weekly* compared to the ones in *Daily*, subjects are more likely to start working on Monday in *Daily*. Moreover, and related to the higher total goal, subjects work more on Mondays in *Daily* than in *Weekly*. Yet, the latter effect is not robustly significant and the effect size is smaller than 0.2. Effort declines over the week at a similar rate in both treatments. There is no catching-up at the end of the week. Thus, these results are only partly consistent with our predictions.

Looking at effort patterns in *DailyAggregated* compared to the ones in *Daily*, subjects are equally likely to start working on Monday but subjects work more on Mondays in *Daily*. While the coefficient is only significant after controlling for gender and productivity, with these controls, it is robustly significant in both the tobit and ols regressions (table 19 in the appendix). So, most likely, the coefficients are imprecisely estimated without the controls. The effect size is small and positive ($d = 0.23$). Furthermore, effort declines more strongly in *Daily* than in *DailyAggregated* – offsetting after a few days the initially positive effect of daily goal feedback.

We summarize our findings:

Result 1 (Effort and goals: weekly vs. daily)

1. *The total goal and total effort are higher in* Daily *than in* Weekly*. The goal level is related to the effort gap. There is some indication that subjects work more on Monday in* Daily *than in* Weekly*. Then effort declines over the week at a similar strength in both treatments.*

2. *Subjects work more on Monday in* Daily *than in* DailyAggregated*, but total effort is the same. Effort declines more over the week in* Daily *than in* DailyAggregated.

treatments with goal setting counted 1000 tables on Monday.

Table 5: Impact of goal and goal setting or feedback format on effort on Monday.

Treatments	Daily vs. Weekly						Daily vs. DailyAggregated		
	(1a & 2)			(1a,1b, & 2)			(1b & 5)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent variable†: Tables counted on Monday								
Daily goal	85.48	93.47*	65.99	71.68	77.83*	46.88			
	(56.14)	(56.10)	(56.10)	(46.72)	(46.05)	(45.61)			
Daily goal feedback[a]							63.75	90.14**	87.49**
							(42.75)	(41.09)	(39.09)
Total goal			0.24***			0.26***			0.30***
			(0.08)			(0.06)			(0.07)
Constant	93.74**	13.67	-122.34	99.33***	-56.60	-203.39*	105.91***	-250.45***	-435.18***
	(38.75)	(140.91)	(145.04)	(37.94)	(108.05)	(108.61)	(28.30)	(94.33)	(100.28)
	Dependent variable‡: Dichotomous variable = 1 if counted > 0 tables on Monday, = 0 otherwise (Marginal effects)								
Daily goals[a]	0.13*	0.14*	0.13*	0.12**	0.13**	0.10*			
	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)			
Daily goal feedback[b]							0.08	0.10	0.11
							(0.07)	(0.07)	(0.07)
Total goal			0.0001			0.0002**			0.0004***
			(0.0001)			(0.0001)			(0.0001)
Controls[c]	N	Y	Y	N	Y	Y	N	Y	Y
N	155	155	155	230	230	230	150	150	150

Notes. †Tobit β-coefficient (marginal effect on the latent dependent variable) or ‡Logit marginal effect, with robust standard error in parenthesis. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

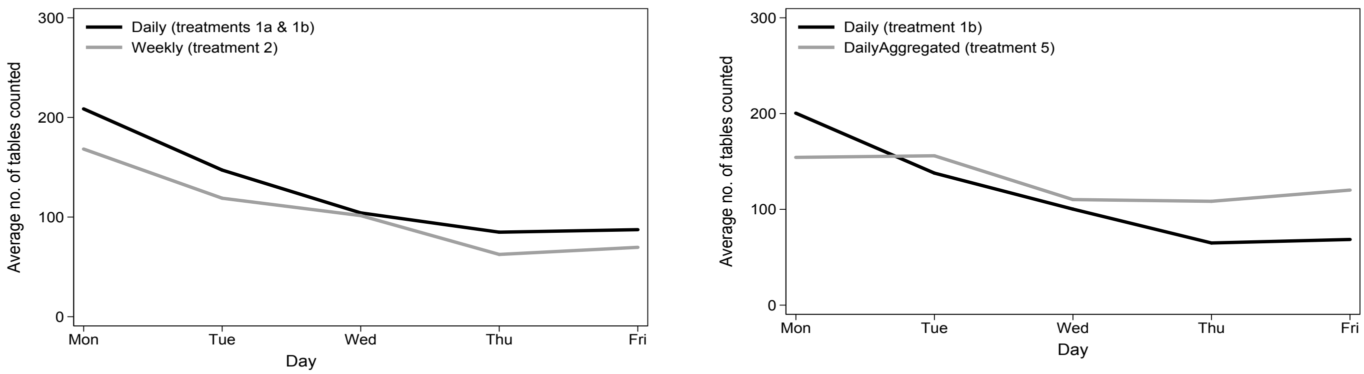
[a]Dummy for daily goal (i.e., dummy for treatment *Daily*). [b]Dummy for daily goal feedback format (i.e., dummy for treatment *Daily*). [c]Additional controls: productivity and a gender dummy.

Table 6: Effort substitution: Time trend in tables counted on a given day.

Treatments	Daily vs. Weekly				Daily vs. DailyAggregated	
	(1a & 2)		(1a,1b, & 2)		(1b & 5)	
	(1)	(2)	(3)	(4)	(7)	(8)
Daily goals[a]	52.34	36.95	55.66	35.44		
	(47.70)	(47.15)	(41.50)	(40.78)		
Daily goal feedback[b]					104.83**	111.47***
					(42.94)	(42.28)
Time trends: Day number						
× (daily goals)[c]	-49.15***	-48.94***	-58.07***	-57.93***		
	(10.07)	(10.01)	(7.11)	(7.07)		
× (weekly goal)[c]	-53.69***	-53.06***	-53.43***	-52.78***		
	(10.65)	(10.58)	(10.28)	(10.20)		
× (daily goal feedback)[c]					-64.75***	-61.95***
					(8.84)	(8.81)
× (weekly goal feedback)[c]					-18.64**	-13.26
					(8.26)	(8.33)
Total goal		0.13***		0.18***		
		(0.04)		(0.003)		
Daily goal[d]						0.34***
						(0.09)
	Test: H_0 no difference in time trends					
$\chi^2(1)$	0.10	0.08	0.14	0.17	14.60***	16.37***
N	775	775	1150	1150	750	750
Individuals	155	155	230	230	150	150

Notes. Dependent variable: Tables counted on a particular weekday. Tobit random effects panel model (including a constant that is not reported and as additional controls productivity and a gender dummy – results are robust to excluding controls). β-coefficient (marginal effect on the latent dependent variable) with robust standard error in parenthesis. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$. [a]Dummy for daily goal (i.e., dummy for treatment *Daily*). [b]Dummy for daily goal feedback format (i.e., dummy for treatment *Daily*). [c]Interaction of day number with dummy for the goal setting/feedback format. [d]In (7) & (8) it is possible to use as control the daily goal for a particular week day instead of the total goal for the week (all subjects here set daily goals, treatments then vary the goal feedback format).

Figure 2: Average daily number of tables counted in the different treatments.



4.3 No goal

Predictions. In *NoGoals*, the individual is not forced to set goals and hence may lack the internal commitment to effort provided by goals. Of course, subjects may privately set goals. Unless all subjects use daily goals, it follows from proposition 1 that effort should be lower in *NoGoals* than in *Daily*.

Results. In table 7, specifications (1),(2),(4) and (5), we observe that effort in treatment *NoGoal* does not differ from the effort in treatment *Daily* and *Weekly*. The effect sizes indicate that there is no effect ($d = 0.12$ for *Daily* and $d = -0.15$ *Weekly* vs. *NoGoal*). This is in contrast to our hypothesis.

We do some exploratory analysis on subpopulations to better understand this result. From table 3, it becomes apparent that women set lower goals than men and that more productive subjects set higher goals. We hence include interaction terms between productivity and the treatment and gender and the treatment in specifications (3) and (6) in Table 7. To facilitate interpretation, we use a dummy variable for high productivity individuals that is equal to one if the productivity of an individual is above the median and 0 otherwise. Results are similar for the continuous variable.

Goals have a positive impact for high productivity individuals and men and a negative impact for low productivity individuals and women. While some coefficients are not significant, we observe that the effect sizes for men are non-negligible and positive ($d = 0.35$ for treatments

1a,b vs. 6, $d = 0.24$ for 1b vs. 6 for *Daily* vs. *NoGoal*; $d = 0.20$ for *Weekly* vs. *NoGoal*). Those for women are close to zero or negative, respectively ($d = -0.06/-0.20$ for *Daily* vs. *NoGoal*; $d = -0.48$ for *Weekly* vs. *NoGoal*).

That goals are more effective for men is consistent with the previous literature (Smithers, 2015; Dalton et al., 2015; Clark et al., 2016). In our experiment, women set much lower goals than men and, because lower goals motivate less, they count fewer tables than men (see table 3). But if we control for the goal level, women seem to count more (these results are not significant though), which suggests that women might employ other means than goals to motivate themselves. The reason that women perform better when they are not instructed to set goals, hence might be because women seem to choose relatively less ambitious goals than men when forced to do so.

Regarding productivity, the effect sizes for *Weekly* vs. *NoGoal* are either small and negative ($d = -0.24$ for low productivity individuals) or close to zero ($d = -0.02$ for high productivity individuals). When comparing *Daily* vs. *NoGoal*, we observe a non-negligible effect sizes for the high productivity individuals ($d = 0.42$ for 1b vs. $6/d = 0.31$ for 1a,b vs. 6) and no effect for the low productivity individuals ($d = -0.16$ for 1b vs. $6/d = -0.00$ for 1a,b vs. 6). These results hint that goals cannot solve the really hard motivational problems from which low productivity individuals might suffer, but help those who have less severe motivational problems to excel more than they would without goals.

Result 2 (No Goal) *There is no significant difference in effort between* Daily *and* NoGoal*. Exploratory analysis hints that for women and low-productivity individuals goals do not matter for or may even harm effort. Men and high-productivity individuals however perform better with goals than with no goals.*

4.4 Mechanisms

To explore some mechanisms behind our results, we analyze two additional treatments (*DailyCommitment* and *WeeklyCommitment*) and make use of the fact that for some treatments (*Daily*, *Weekly*, *DailyCommitment* and *WeeklyCommitment*) we have a measure of self-control for a subpopulation that participated in a previous survey experiment.

Table 7: Impact of goals vs. no goals on total effort.

Treatments	Weekly/Daily vs. NoGoal (1a, 1b, 2, & 6)			Daily vs. NoGoal (1b & 6)		
	(1)	(2)	(3)	(4)	(5)	(6)
Daily goals[a]	63.25	42.83	101.61	-16.56	19.50	-58.81
	(104.89)	(101.50)	(166.21)	(136.07)	(129.29)	(206.88)
Weekly goal[a]	-108.15	-125.43	86.46			
	(112.10)	(108.89)	(176.53)			
High productivity[b]		306.36***	83.48		379.21***	81.26
		(80.24)	(168.79)		(136.08)	(180.06)
Female		70.88	376.76**		257.68*	399.80**
		(79.94)	(171.76)		(130.96)	(183.39)
Female*Daily[c]			-307.17			-210.21
			(206.39)			(259.22)
Female*Weekly[c]			-538.93**			
			(224.01)			
(High productivity)*Daily[c]			310.31			591.84**
			(205.45)			(279.10)
(High productivity)*Weekly[c]			229.27			
			(221.87)			
Constant	738.25***	588.31***	493.55***	769.55***	477.73***	504.99***
	(89.49)	(102.95)	(135.85)	(102.50)	(128.32)	(145.63)
N	301	300	300	146	145	145

Notes. Dependent variable: Total effort (tables counted over all five days). Tobit β-coefficient (marginal effect on the latent dependent variable) with robust standard error in parenthesis. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. [a]Dummy for daily goal (i.e., dummy for treatment *Daily*) or for weekly goal (treatment *Weekly*). [b]Dummy for the productivity being above the median. [c]Interactions between goal format (*Daily* or *Weekly*) and female dummy or high productivity dummy, respectively.

4.4.1 Self-control

Predictions. Our model builds on the idea that subjects use narrow goals to overcome self-control problems. For treatment *Daily*, our model predicts (cf. proposition 1) that for a not too severe self-control problem goals alone should help the individual to fully overcome his self-control problem. That is, the individual implements the desired effort of self 0 (e_0^*) and, consequently, self-control should not have an impact on the total goal and total effort in *Daily*. If the self-control problem is severe, the individual cannot implement his desired effort, but only $e_{max}(\beta)$, which is increasing in the self-control parameter β. To summarize, for low self-control individuals, a higher level of self-control should be associated with higher goals and higher effort in *Daily*. For high self-control individuals, effort and goals should not depend on the level of self-control.

In contrast, for treatment *Weekly*, we predict that effort substitution arises. Consequently, the total goal and total effort depend on the extent of the self-control problem (for details see the proof of proposition 4 in the appendix): the lower the self-control, the lower the goals and effort. In addition, for $\beta \to 1$, the theory predicts that the goal and effort in *Weekly* approach those in *Daily*. That is, the goal and effort gaps between *Weekly* and *Daily* should be smaller for subjects with high self-control.

Measure. We administered to all first year students at Business and Social Science, Aarhus University, Denmark in Fall 2013 an online survey experiment that consisted of several incentivized tasks and a questionnaire (for a description see Epper et al., 2015). A total of 643 participants (response rate 21%) completed the survey, and we recruited from this pool the subjects for *Daily* and *Weekly* (see table 1). For all of them we have available the *Brief self-control scale*, which exhibits good external validity, correlating for example with grades and substance abuse (Tangney et al., 2004). It consists of 13 items such as "I am good at resisting temptations" or "Pleasure and fun sometimes keep me from getting work done". Answers are rated on a 5-point Likert scale. The scale takes the average rating across all 13 items (ranging from 1 to 5), where higher values indicate higher self-control. For better interpretability, we construct a dummy variable that is equal to one if the score of an individual on the scale is above the median score (high self-control individuals) and 0 else. Signs in the regressions are similar if we use the continuous variable.

The original research plan was to include as the measure of self-control a structural estimate of the present-bias parameter β, elicited using the procedure outlined by Augenblick et al. (2015). Specifically, we invited all participants who completed the survey mentioned above to participate in a follow-up online study, which about half of them did.

It turned out that 53 percent of the subjects made choices that violated monotonicity in the price of postponing effort – in contrast to only 10 percent in Augenblick et al.[9] If we include the individual β in the regressions, we observe that the present-bias parameter has no significant impact. Restricting the analysis to those subjects whose choices satisfy monotonicity would make sense, but then the sample sizes become too small for reliable estimates.

Results. In table 8, high self-control has the predicted sign, though the coefficient is not significant. For treatment *Daily*, high self-control has a neutral or negative impact ($d = -0.00$ for goals, $d = -0.26$ for effort). While the neutral impact is consistent with the predictions, the negative impact is not. For treatment *Weekly*, as hypothesized, high self-control individuals set higher goals and count more tables than low self-control individuals – though the coefficients are imprecisely estimated ($d = 0.47$ for goals and $d = 0.22$ for effort). Finally, the interaction effect *Daily*High self-control* reveals that the positive impact of daily goals on total goal and total effort is smaller for high self-control individuals than for low self-control individuals (effect sizes for high/low self control: $d = 0.06/0.27$ for goals and $0.09/0.34$ for effort), which is consistent with our model.

4.4.2 Narrow goals and self control

In Koch and Nafziger (2017), we provide some further correlational evidence that narrow goal setting is related to self-control. One question of the aforementioned survey asked participants to consider the hypothetical situation where two weeks before an exam the lecturer

[9] Because our study ran purely online some subjects might have put less care in reading the instructions than in the study of Augenblick et al., where subjects were instructed about the study in the lab and made their initial choices in the lab (the rest of their study also ran online). Indeed, those subjects who violated monotonicity apparently did not deeply reflect upon their choices. The survey experiment also included the cognitive reflection task by Frederick (2005). The higher the number of correct answers in the cognitive reflection test, the more likely that choices satisfy monotonicity (Spearman's rho=0.16, $p = 0.01$).

Table 8: Impact of goal setting format and self-control on total goal and total effort: *Daily* vs. *Weekly*.

Dependent variable	Total goal		Total effort	
	(1)	(2)	(3)	(4)
Daily[a]	172.40*	332.33**	152.63*	215.53*
	(89.19)	(136.49)	(91.36)	(126.43)
High self-control[b]	38.35	181.39	38.88	95.60
	(90.39)	(126.19)	(90.84)	(118.94)
Daily*(High self-control)		-302.99*		-119.34
		(182.93)		(182.94)
Goal			0.60***	0.59***
			(0.14)	(0.14)
Female	-418.14***	-425.96***	51.72	48.16
	(90.30)	(89.50)	(99.27)	(99.26)
Productivity	23.52**	27.68**	23.82**	25.56**
	(11.02)	(11.22)	(10.47)	(10.79)
Constant	667.76***	529.60**	-235.48	-286.40
	(188.35)	(203.13)	(168.41)	(181.93)
N	155	155	155	155

Notes. Dependent variable: Total goal in (1)&(2); total effort (tables counted over all five days) in (3)&(4). Tobit β-coefficient (marginal effect on the latent dependent variable) with robust standard error in parenthesis. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. [a]Dummy for daily goal (i.e., dummy for treatment *Daily*). [b]Dummy for the score on the brief self-control scale being above the median.

hands out 30 practice exams. It takes 4 hours to work on a practice exam. Participants are then asked whether and how they set goals for the number of exams they solve: daily goal, weekly goal, overall goal for the 2 weeks, or no goal. In Koch and Nafziger (2017), we create a dummy variable that is equal to 1 if the subject chooses a daily goal and 0 if he chooses any other goal type. We find that setting narrow goals is associated with better realized self-control, as measured by the brief self-control scale by Tangney et al. (2004).

4.4.3 Alternative mechanisms

In the absence of both uncertainty and a self-control problem, our theoretical model predicts that individuals achieve exactly the same effort schedule under daily and weekly goals. With uncertainty, differences across treatments could arise even in the absence of a self-control problem, as Koch and Nafziger (2016) demonstrate. Then broad goals yield a higher utility than narrow goals and, consequently, a risk averse individual would set higher goals and perform better with broad goals than with narrow goals. As this is the opposite of our findings, such uncertainty cannot – in the absence a self-control problem – explain our results.

Further, we believe that uncertainty is unlikely to play a role in our setting. Payments are certain (see footnote 6). Yet, subjects might perceive e.g. their effort costs as uncertain. Uncertainty in effort costs is in our view very unlikely for the subjects recruited from the participants in the aforementioned survey experiment (see table 1: *Daily, Weekly, DailyCommitment*, and *WeeklyCommitment*): these subjects did not only perform the counting task for 3 minutes prior to the goal setting stage but for around 1-2 hours (to elicit, as mentioned above, the present-bias with the procedure by Augenblick et al. (2015)). Uncertainty in effort costs is more likely to arise in the treatments that were not coupled to the survey experiment (*DailyAggregated, Daily(R)*, and *NoGoal*), but here it should also matter less from a theoretical point of view.

Furthermore, note that in the absence of a self-control problem, the individual could implement the same effort schedule under broad and narrow goals. Thus, learning, say, about uncertain effort costs, would take place in the same way under broad and narrow goals and cannot explain our results.

Other psychological mechanisms might be at play though. People might set higher daily goals than weekly goals because they feel reluctant to move the slider to a large number. Or they may make small, upward biased mistakes when setting goals. As subjects have to move the slider five times when setting daily goals compared to one time when setting a weekly goal, the sum of these small mistakes is larger when setting daily goals.

Both mechanisms suggest that there is a lower chance of the total goal being 'too high' when setting a weekly goal than when setting daily goals. A proxy for the total goal being 'too high' can be constructed from a question that subjects answered right before learning that they should set goals: They estimated the maximum number of tables they would be able to complete if they used all the free time they have available to work on the tasks. Comparing the proportion of subjects for whom the total goal exceeds this number, we reject a treatment difference (Fisher's exact test, p=0.22). If at all, the observed pattern goes against the alternative explanation: The total goal exceeds the maximum number of tables subjects thought they could solve for 30 percent of the subjects who set a weekly goal, but only for 23 percent of the subjects who set daily goals.

4.4.4 Is it about getting started?

In our model we assumed that people just choose their effort. But in practice the effort decision is more complex: subjects need to follow the emailed link, start solving tables ('getting started') and then to continue to work towards their goal ('getting finished'). When we examine these two dimensions, subjects with daily goals are more likely to get started: we observe that on average there is one extra login during the week for treatment *Daily* versus *Weekly* (6.9 vs. 5.9, Mann-Whitney test, $p = 0.09$)[10] and subjects in *Daily* log in on more weekdays than subjects in *Weekly* (3.3 vs. 2.7, Mann-Whitney test, $p = 0.01$). And, once logged on, subjects with daily goals work more: subjects count more tables per login in *Daily* than in *Weekly* (131 vs. 104, Mann-Whitney test, $p = 0.03$).

To explore further how the intensive and extensive margins interact, i.e. whether getting started helps subjects to get finished, we conduct additional treatments *DailyCommitment* and *WeeklyCommitment*. These treatments mirror *Daily* and *Weekly*, respectively. The only difference is that we introduce a weak external commitment device: In *DailyCommitment*

[10]Note that the test compares the distributions across treatments and not the means.

and *WeeklyCommitment*, subjects are informed that they need to count at least one table per day to qualify for payments (see below). If they fail to do so, they lose all earnings for the week.[11]

Predictions (without a formal theory). While the minimum work requirement does not commit subjects to fulfil a certain workload, it commits them to 'get started' each day. The idea behind the commitment device is that, once a subject clicked on the link and solved one table, he might continue to work. If 'getting started' indeed helps to 'get finished', then the commitment device should reduce the problem of low effort provision and effort substitution in *WeeklyCommitment* compared to *DailyCommitment*.

Results. Goals do not differ significantly between *DailyCommitment* and *WeeklyCommitment* (see table 18 in the appendix). Yet, the effect size of the treatment is non-negligible ($d = 0.39$). Thus, it appears that the coefficients are imprecisely estimated and that subjects set higher goals in *DailyCommitment* than in *WeeklyCommitment*.
Despite the (possibly) higher goals, we observe no significant difference in effort between treatments *DailyCommitment* and *WeeklyCommitment* (see table 18 in the appendix), and the effect size, too, indicates that there is no effect ($d = -0.16$). Similarly, there is no treatment difference in the number of logins and tables counted per login (Mann-Whitney, $p = 0.28/p = 0.91$). All of this suggests that the positive motivational force of narrow, daily goals in comparison to broad goals disappears when people are forced to 'get started'.
One explanation is that much of the motivational power of a daily goal comes from helping people to get started working regularly. As the external commitment device does the same, the performance difference between treatments *DailyCommitment* and *WeeklyCommitment* vanishes. Further support for this interpretation comes from the observation that no effort substitution arises in *WeeklyCommitment* compared to *DailyCommitment*. First, there is no positive Monday-effect in *DailyCommitment* compared to *WeeklyCommitment* (β=27.92, se=54.89). Second, the null hypothesis that there is no difference in time trends in effort cannot be rejected ($\chi^2(1) = 1.78$, $p > 0.1$). This result is consistent with the hypothesis that

[11] The only exception is if a person reaches the 1,000 tables before Friday – then no further actions are required (though this was not made explicit in the instructions in order to avoid an incentive to finish early).

the external commitment prevents effort substitution in treatment *WeeklyCommitment*.

5 The effects of external commitment

Adding the commitment device allows us to examine how an external commitment device complements internal commitment through goals (comparisons of treatments *Daily* and *DailyCommitment*, as well as *Weekly* and *WeeklyCommitment*, respectively).

Predictions (without a formal theory). The daily minimum work requirement in *DailyCommitment* and *WeeklyCommitment* is a (weak) commitment device. In general, as, e.g., Ariely and Wertenbroch (2002) discuss, externally set commitment devices harm time-consistent individuals because they take away flexibility, but they can benefit time-inconsistent individuals. To fulfill the minimum work requirement, subjects only have to spend around 1 minute per day (turn the computer on, click the emailed link, solve one table). The commitment device thus still allows to flexibly distribute effort over the five workdays and minimizes, as much as possible, the loss in flexibility that an external commitment device brings along. Only those subjects who rationally anticipate to be away from a computer with internet access for a whole day during the work week (a situation that is quite unlikely during term time) should dropout. Thus, we expect a higher total goal and total effort in *DailyCommitment* (*WeeklyCommitment*) than in *Daily* (*Weekly*).

Results. In table 9, we report the results. We observe that goals do not differ significantly between *Daily* and *DailyCommitment*, yet the coefficients and effect sizes are non-negligible and indicate that subjects set higher goals in *DailyCommitment* ($d = 0.24$). A similar observation arises for *Weekly* and *WeeklyCommitment* ($d = 0.20$). Yet, when looking at effort, we observe that subjects count less in *DailyCommitment* than in *Daily*, and that there is no significant difference between *WeeklyCommitment* and *Weekly*. These effects arise even though there is some indication that subjects set higher goals when facing the commitment device. The effect sizes confirm this picture. There is no effect ($d = 0.09$) for *WeeklyCommitment* vs. *Weekly* and a medium-sized, negative effect ($d = -0.50$) for *DailyCommitment* vs. *Daily*.

To understand the mechanisms behind this surprising result, we do some exploratory analysis and look at the dropout behavior in the different treatments. We hypothesized that the commitment device does not take away much flexibility and is rather easy to achieve. As an implication, we expected similar dropout rates in the treatments with and without the external commitment device. This, however, is not the case as table 10 shows. With the external commitment, the dropout probability increases from around 4 percent (treatments *Daily* and *Weekly*) to over 30 percent (*DailyCommitment* and *WeeklyCommitment*).

Further, the table reveals that the dropout behavior is not driven by dropout during the week, but by failing to start right from the beginning. Specifically, the daily minimum work requirement seems to exclude those who would count later than Monday. In the treatments without the requirement, quite a few start to work later than Monday and there is a roughly similar tendency to work on Monday with and without the requirement. Thus, our data reveal that even a weak externally imposed commitment device can cause serious harm by leading to substantial dropout.

We can explore one possible explanation for this dropout, namely that subjects do not like to be controlled.[12] In our prior survey study (Epper et al., 2015), as mentioned above, we have a question about whether a subject would set a daily goal, weekly goal, overall goal, or no goal in exam preparation. We construct a dummy variable which is equal to one if a participant indicates that he would set no goal. Setting no goal is correlated with dropout (Spearman's rho= 0.40, $p < 0.001$ for the commitment treatments). This suggests that subjects who would not set goals for themselves get upset when they are nudged to do so and are forced to work every day. They respond to this negative feeling by dropping out. In this respect, our results hint at "hidden costs of control" (Falk and Kosfeld, 2006).

In a next step, we compare the goal and effort of the subjects conditional on participation to examine whether the external commitment device has any benefits for those who do participate. For total goals, commitment does not have a significant effect. Yet, the coefficients are large and at least for *WeeklyCommitment* vs. *Weekly* the effect size is nonnegligible (*Dai-*

[12] Another explanation would build on the work of Bénabou and Tirole (2004): The external commitment might be a bad signal about effort costs and thereby crowd out intrinsic motivation. We have no measure available to test for this explanation. However, we believe that intrinsic motivation for the counting task is likely to be low from the start.

lyCommitment vs. *Daily*: β=124.36, se=115.13, $d = 0.17$; *WeeklyCommitment* vs. *Weekly*: β=178.6271, se=140.769, $d = 0.23$) – indicating that those subjects who do not drop out might set higher goals when facing the commitment device.

For effort, we observe no significant difference between *DailyCommitment* and *Daily* (and the effect size is close to zero, $d = -0.07$). However, effort is significantly higher in *WeeklyCommitment* than in *Weekly* and the effect size is large ($d = 0.73$). The effect remains robust even after controlling for the goal level (which we have seen to be higher with the commitment device). Moreover, subjects in *WeeklyCommitment* count significantly more tables on each workday than subjects in *Weekly*, even if we control for the goal level.[13] That is, those subjects who participate work more regularly in *WeeklyCommitment* than in *Weekly*.[14]

Thus, overall, a daily goal without an additional externally enforced login requirement seems to do best when considering all subjects, because it induces individuals to 'get started' and thereby helps them to 'get finished'. At the same time, it avoids the problem of dropout that an external commitment device brings along. Further, under a daily goal, the external commitment device has no impact on those who participate. In contrast, for those subjects who actually participate, a weekly goal coupled with the commitment device seems to work best.[15] The commitment device forces them to work regularly, and 'getting started' helps them to 'get finished'. In addition, once forced to start with the task, people with a weekly goal see a much higher number than people with a daily goal and this higher number seems to motivate them more. This suggests that, when facing a weak internal commitment device (a broad goal), external commitment can benefit those who participate by helping them to 'get started'. Yet, when facing a strong internal commitment device (a daily goal), an additional external commitment device does not help those who participate and does harm

[13]Mon: β=107.25**, se= 48.34, Tue: β=64.32*, se=34.58, Wed: β=179.20***, se=43.98, Thu: β=102.52**, se=44.27, Fr: β=110.95**, se=45.45. Unsurprisingly, given the large dropout in *WeeklyCommitment*, there are no such significant differences if we include those who drop out in the regressions.

[14]We do not have a clear cut hypothesis regarding differences in effort patterns over the week in these two treatments. Given that the goal levels between the two treatments are predicted to differ, we would possibly expect a similar pattern as for the comparison between *Daily* and *Weekly*. The null hypothesis that there is no difference in time trends cannot be rejected ($\chi^2(1) = 0.11$, $p = 0.74$).

[15]We observe that those subjects who do not drop out work on average more in *WeeklyCommitment* than in *Daily* ($\beta = -238.05^{*}$, se=130.15).

by causing substantial dropout.

Result 3 (Effort and goals: External commitment device)

1. *There is no significant difference in total goals between* DailyCommitment *(*WeeklyCommitment*) and* Daily *(*Weekly*), respectively.*

2. *The external commitment device has no impact, or a negative impact on performance. Total effort is significantly lower in* DailyCommitment *than in* Daily*, because dropout increases by 30 percent. Conditional on participation, there is no difference in total effort. There is no significant difference in total effort between* WeeklyCommitment *and* Weekly*. While external commitment increases dropout by 31 percent, total effort also increases conditional on participation and this offsets the effect of dropout.*

6 Conclusion

This paper provides a theoretical framework and evidence for the motivational benefits of narrowly bracketed, daily goals. In an online experiment, we exogenously assign the goal bracket (daily or weekly) and let subjects choose their goals. The performance of subjects is higher under narrow, daily goals than under broad, weekly goals. Our results reveal that the increase in performance is primarily related to the higher level of goals set when goals are bracketed narrowly rather than broadly, and not by the feedback format about goals. Further, we examine the effect of an externally enforced weak commitment device that helps individuals to 'get started' each day. Surprisingly, we observe that this external commitment device reduces performance. Even though the commitment device only requires less than a minute of work each day, it leads to substantial dropout from the task.

Table 9: Impact of login requirement on total goal and on total effort.

Dependent variable	Total goal		Total effort (tables counted)							
Sample	All		All		No dropout[a]		All		No dropout[a]	
Treatments	(1a,2,3 & 4)	(1a,1b,2,3,4 & 5)	(1a,2,3 & 4)		(1a,2,3 & 4)		(1a,1b,2,3,4 & 5)		(1a,1b,2,3,4 & 5)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Test of H_0: no difference in goal/count with or without minimum work requirement for daily goals set										
DailyCommitment[b]	119.21	125.04	-323.16**	-371.54**	150.93	79.46	-266.79*	-320.89**	175.12	128.99
vs. Daily	(100.95)	(80.72)	(154.47)	(149.90)	(142.76)	(130.09)	(147.04)	(142.13)	(138.44)	(127.59)
Total goal				0.61***		0.72***		0.76***		0.75***
				(0.14)		(0.12)		(0.13)		(0.11)
Test of H_0: no difference in goal/count with or without minimum work requirement for weekly goal set										
WeeklyCommitment[b]	155.59	142.27	-9.36	-65.91	480.04***	394.14***	-16.04	-81.07	484.73***	404.35***
vs. Weekly	(115.42)	(110.70)	(159.57)	(153.73)	(139.65)	(126.59)	(162.50)	(155.31)	(145.54)	(131.36)
Total goal				0.61***		0.72***		0.76***		0.75***
				(0.14)		(0.12)		(0.13)		(0.11)
N	246	396	246	246	208	208	321	321	275	275

Notes. Tobit β-coefficient (marginal effect on the latent dependent variable) with robust standard error in parenthesis. Each cell reports the regression coefficient from a separate regression with the omitted category given by "vs." (specifications include a constant and as additional controls productivity and a gender dummy; robust to dropping controls). $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. [a]No dropout: dummy for having counted more than zero tables and, if relevant, satisfied the daily minimum work requirement. [b]Dummy for treatment *DailyCommitment* or *WeeklyCommitment*, respectively.

Table 10: Dropout.

Treatment	N	Drop out/zero count[a]		Login Monday		Total counted (mean)	
		N	Percent	N	Percent	Full sample	Not dropped out
Daily (1a)	78	3	3.8	62	79.5	690.0	717.6
Daily (1b)	75	3	10.7	59	78.7	572.0	640.3
Weekly (2)	77	3	3.9	51	66.2	520.8	541.9
DailyCommitment (3)	47	17	36.2	35	74.5	487.1	744.9
WeeklyCommitment (4)	45	15	33.3	32	71.1	558.3	811.1

Impact of minimum work requirement on probability of dropout/logging in on Monday.[b]

Marginal effect of minimum work requirement vs. no requirement (percentage points).

	Drop out/zero count	Login Monday
All	29.54***	-3.21
	(5.42)	(5.65)
DailyCommitment[c]	29.51***	-5.63
vs. Daily	(7.65)	(7.52)
WeeklyCommitment[c]	30.72***	3.12
vs. Weekly	(7.58)	(8.74)
N	321	321

Notes. [a]Dropout: dummy for having counted zero tables or, if relevant, failed to satisfy the daily login requirement. [b]Logit marginal effect, with robust standard error in parenthesis (using treatments 1a, 1b, 2, 3 & 4). Each cell reports the regression coefficient from a separate regression with the omitted category given by "vs." (specifications include a constant and as additional controls total goal, productivity, and a gender dummy. Results are robust without controls). *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. [c]Dummy for treatment *DailyCommitment* or *WeeklyCommitment*, respectively.

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Appendix

A Supplementary Tables

Table 11: Likelihood of achieving the total goal (Logit regressions).

Treatments	Daily vs. Weekly (1a & 2)	Daily vs. Weekly (1a, 1b & 2)	DailyCommitment vs. WeeklyCommitment (3 & 4)	Daily vs. DailyAggregated (1b & 5)	Weekly vs. DailyAggregated (2 & 5)
	(1)	(2)	(3)	(4)	(5)
Daily goals[a]	0.04	-0.01	-0.18		-0.05
	(0.08)	(0.07)	(0.11)		(0.09)
Daily goal feedback[b]				-0.10	
				(0.09)	
Total goal	-0.00*	-0.00	-0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Productivity	0.02**	0.03***	0.01	0.03***	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Female	0.01	0.04	-0.00	0.24**	0.01
	(0.09)	(0.07)	(0.11)	(0.09)	(0.09)
N	155	230	91	150	152

Notes. Dependent variable: Dummy for total effort $\geq$ total goal. Logit marginal effect with robust standard error in parenthesis. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$. [a]Dummy for daily goal (i.e., dummy for treatment *Daily*). [b]Dummy for daily goal feedback format (i.e., dummy for treatment *Daily*).

Table 12: Likelihood of a censored goal (Logit regressions).

Treatments	Daily vs. Weekly (1a & 2)	Daily vs. Weekly (1a, 1b, 2 & 5)	DailyCommitment vs. WeeklyCommitment (3 & 4)
	(1)	(2)	(3)
Daily goals[a]	0.06	0.02	-0.02
	(0.09)	(0.07)	(0.11)
Productivity	0.02*	0.02***	0.01
	(0.01)	(0.01)	(0.01)
Female	-0.31***	-0.21***	-0.15
	(0.09)	(0.06)	(0.11)
N	155	305	91

Notes. Dependent variable: Censored goal (dummy for total goal=1000). Logit marginal effect with robust standard error in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. [a]Dummy for daily goal setting (i.e.,dummy for treatment being *Daily* or *DailyAggregated*; in the latter subjects also set daily goals and the feedback format is assigned only after goals are set).

Table 13: Likelihood of a censored count (Logit regressions).

Treatments	Daily vs. Weekly (1a & 2)	Daily vs. Weekly (1a, 1b & 2)	DailyCommitment vs. WeeklyCommitment (3 & 4)	Daily vs. DailyAggregated (1b & 5)	Weekly vs. DailyAggregated (2 & 5)	Daily/Weekly vs. NoGoal (1a, 1b, 2, 5 & 6)
	(1)	(2)	(3)	(4)	(5)	(6)
Daily goals[a]	0.07	0.08	-0.10		0.07	-0.01
	(0.08)	(0.07)	(0.11)		(0.09)	(0.07)
Daily goal feedback[b]				0.02		
				(0.09)		
Weekly goal[a]						-0.14*
						(0.08)
Total goal	0.00***	0.00***	0.00**	0.00***	0.00***	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	
Productivity	0.02*	0.02***	0.01	0.02*	0.01	0.02***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Female	-0.05	-0.01	-0.11	0.15	0.07	-0.01
	(0.08)	(0.07)	(0.11)	(0.10)	(0.09)	(0.06)
N	155	230	91	150	152	300

Notes. Dependent variable: Censored count (dummy for total effort=1000). Logit marginal effect with robust standard error in parenthesis. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. [a]Dummy for daily goal (i.e., dummy for treatment *Daily*) or for weekly goal (treatment *Weekly*). [b]Dummy for daily goal feedback format (i.e., dummy for treatment *Daily*).

Table 14: Check of successful randomization and framing: Daily vs. DailyAggregated (treatments 1b & 5).

Dependent variable	Total goal				
	OLS	Tobit	SCLS		
Daily goal feedback[a]	7.90	-15.52	160.56		
	(43.94)	(75.77)	(182.82)		
N	150	150	150(85)[b]		
Dependent variable	**Daily no. of tables counted**				
	Mon	Tue	Wed	Thu	Fri
(Daily goal level)	0.74***	0.98***	0.87**	0.63**	0.72
x Daily[c]	(0.26)	(0.23)	(0.34)	(0.28)	(0.45)
(Daily goal level)	0.11	0.21	0.08	-0.30	0.61*
x DailyAggregated[c]	(0.16)	(0.29)	(0.28)	(0.36)	(0.34)
N	150	149[d]	139[d]	133[d]	120[d]

Notes. For dependent variable total goal: Coefficient with robust standard error in parenthesis for ordinary least squares (OLS), tobit (β, i.e., the marginal effect on the latent dependent variable), and symmetrically censored least squares (SCLS). For dependent variable daily no. of tables counted: Tobit β-coefficient with robust standard error in parenthesis. All models include a constant and as additional controls productivity and a gender dummy. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. [a] Dummy for daily goal feedback format (i.e., dummy for treatment *Daily*). [b]Number of observations effectively used in the SCLS regressions in parenthesis. [c]Interaction between treatment dummy and the daily goal level. [d]Excludes subjects whose cumulative count reached 1000 on the previous day.

Table 15: Impact of goal setting format on total goal: *Daily* vs. *Weekly*.

	OLS	Tobit	SCLS	OLS	Tobit	SCLS
	(1a & 2)	(1a & 2)	(1a & 2)	(1a, 1b, 2 & 5)[b]	(1a, 1b, 2 & 5)	(1a, 1b, 2 & 5)
	(1)	(2)	(3)	(4)	(5)	(6)
Daily goals[a]	118.19**	173.14*	399.84**	122.23***	155.08**	699.36**
	(48.45)	(89.37)	(189.39)	(40.57)	(69.65)	(293.47)
Productivity	12.92**	24.17**	55.14	11.04***	23.76***	51.77
	(5.90)	(11.08)	(51.83)	(3.71)	(7.04)	(56.76)
Female	-226.08***	-417.57***	-429.58	-132.23***	-250.02***	-444.18
	(47.14)	(90.65)	(337.20)	(32.67)	(60.58)	(327.19)
Constant	584.04***	677.16***	132.26	567.44***	577.53***	191.51
	(101.80)	(184.81)	(578.17)	(71.44)	(127.31)	(622.89)
R^2	0.16			0.09		
N	155	155	155(81)[b]	305	305	305(71)[b]

Notes. Dependent variable: Total goal. Coefficient with robust standard error in parenthesis for ordinary least squares (OLS), tobit (β, i.e., the marginal effect on the latent dependent variable), and symmetrically censored least squares (SCLS). *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. [a]Dummy for daily goal setting (i.e.,dummy for treatment being *Daily* or *DailyAggregated*; in the latter subjects also set daily goals and the feedback format is assigned only after goals are set). [b]Number of observations effectively used in the SCLS regressions in parenthesis.

Table 16: Impact of goal and goal setting or feedback format on total effort (OLS regressions).

Treatments	Daily vs. Weekly				DailyCommitment WeeklyCommitment		Daily vs. DailyAggregated		DailyAggregated vs. Weekly		Weekly/Daily NoGoal
	(1a & 2)		(1a,1b, & 2)		(3 & 4)		(1b & 5)		(2 & 5)		(1a, 1b, 2, & 6)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Daily goals[a]	164.03***	111.14*	116.15**	57.31	-56.48	-87.41			118.37*	52.96	30.91
	(60.35)	(58.18)	(53.05)	(49.92)	(94.48)	(95.88)			(62.57)	(61.70)	(57.08)
Daily goal feedback[b]							-37.92	-42.01			
							(65.82)	(62.18)			
Weekly goal[a]											-82.81
											(63.86)
Total goal		0.45***		0.50***		0.29*		0.52***		0.47***	
		(0.09)		(0.08)		(0.16)		(0.10)		(0.10)	
Productivity	20.80***	15.01**	24.99***	19.26***	11.24	10.73	22.90***	16.89**	21.14***	15.84**	21.95***
	(6.27)	(6.17)	(5.40)	(5.32)	(11.47)	(11.29)	(7.25)	(7.29)	(7.11)	(7.18)	(5.04)
Female	-27.95	73.22	4.46	75.90	14.75	23.90	126.73*	144.71**	58.36	141.50**	55.14
	(62.21)	(61.24)	(51.80)	(48.32)	(99.35)	(99.12)	(68.50)	(65.13)	(66.30)	(66.27)	(46.28)
Constant	193.35*	-68.01	108.10	-174.55*	358.10*	146.21	186.90	-136.65	143.95	-129.40	215.17**
	(110.24)	(109.22)	(99.75)	(93.96)	(209.61)	(216.95)	(140.28)	(140.22)	(123.58)	(131.90)	(96.69)
R^2	0.10	0.21	0.08	0.22	0.02	0.05	0.08	0.20	0.08	0.20	0.07
N	155	155	230	230	91	91	150	150	152	152	300

Notes. Dependent variable: Total effort (tables counted over all five days). OLS coefficient with robust standard error in parenthesis. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. [a]Dummy for daily goal (i.e., dummy for treatment *Daily* or *DailyCommitment*) or dummy for weekly goal (treatment *Weekly*). [b] Dummy for daily goal feedback format (i.e., dummy for treatment *Daily*).

Table 17: Impact of goal and goal setting or feedback format on total effort (SCLS regressions).

Treatments	Daily vs. Weekly				DailyCommitment WeeklyCommitment		Daily vs. DailyAggregated		DailyAggregated vs. Weekly		Weekly/Daily NoGoal
	(1a & 2)		(1a,1b, & 2)		(3 & 4)		(1b & 5)		(2 & 5)		(1a, 1b, 2, & 6)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Daily goals[a]	638.10***	201.96	239.59*	69.30	-110.95	-82.63			402.31**	114.42	99.85
	(126.45)	(124.89)	(122.49)	(88.62)	(299.44)	(251.51)			(175.81)	(136.53)	(168.98)
Daily goal feedback[b]							-134.00	-66.60			
							(195.55)	(132.80)			
Weekly goal[a]											-124.99
											(153.85)
Total goal		0.68***		0.79***		0.59		-0.84***		0.70**	
		(0.17)		(0.15)		(0.52)		(0.21)		(0.32)	
Productivity	46.78**	18.92	33.79**	17.89*	18.68	23.67	45.05	29.15**	58.23***	32.68***	29.14**
	(20.22)	(11.99)	(13.79)	(10.12)	(34.39)	(28.18)	(31.98)	(14.59)	(21.23)	(10.85)	(12.24)
Female	-142.22	48.54	-48.28	123.82	26.66	-114.89	145.07	147.26	-154.28	93.38	41.14
	(179.17)	(121.68)	(124.07)	(81.35)	(346.26)	(308.74)	(194.30)	(136.01)	(175.20)	(173.57)	(112.74)
Constant	-131.38***	-208.67***	13.87***	-282.95***	310.17	-88.29**	-3.85**	-426.54***	-290.27***	-463.30***	167.37***
	(239.86)	(178.63)	(208.79)	(168.38)	(707.36)	(461.97)	(495.39)	(304.14)	(249.64)	(221.57)	(235.87)
N	155	155	230	230	91	91	150	150	152	152	300

Notes. Dependent variable: Total effort (tables counted over all five days). SCLS coefficient with robust standard error in parenthesis. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$. [a]Dummy for daily goal (i.e., dummy for treatment *Daily* or *DailyCommitment*) or dummy for weekly goal (treatment *Weekly*). [b] Dummy for daily goal feedback format (i.e., dummy for treatment *Daily*).

Table 18: Impact of goal setting format on total goal, total effort, and effort on Monday: *DailyCommitment* vs. *WeeklyCommitment*.

Dependent variable	Total goal	Total effort		Effort Monday	
	(1)	(2)	(3)	(4)	(5)
Daily goals[a]	129.00	-73.30	-152.09	41.03	27.92
	(117.55)	(268.39)	(271.29)	(56.33)	(54.89)
Total goal			0.69		0.12
			(0.44)		(0.09)
Productivity	5.72	25.32	23.26	3.68	3.44
	(14.85)	(32.21)	(31.71)	(6.22)	(6.28)
Female	-119.16	-2.96	17.01	-3.14	-0.22
	(126.03)	(290.85)	(286.61)	(62.51)	(61.28)
Constant	942.68***	259.77	-224.41	57.59	-33.22
	(270.38)	(597.64)	(607.63)	(111.25)	(113.50)
N	91	91	91	91	91

Notes. Dependent variable: Total goal in (1)&(2), total effort (tables counted over all five days) in (3)&(4), and tables counted on Monday in (5)&(6). Tobit β-coefficient (marginal effect on the latent dependent variable) with robust standard error in parenthesis. SCLS is not possible to estimate because of an insufficient number of usable observations. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. [a]Dummy for daily goal (i.e.,dummy for treatment *DailyCommitment*).

Table 19: Getting started: Tables counted on Monday (OLS regressions).

Treatments	Daily vs. Weekly				DailyCommitment WeeklyCommitment		Daily vs. DailyAggregated		DailyAggregated vs. Weekly	
	(1a & 2)		(1a,1b, & 2)		(3 & 4)		(1b & 5)		(2 & 5)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Daily goals[a]	51.71	30.96	44.03	21.52	29.90	16.77			-11.60	-43.21
	(39.53)	(40.18)	(32.52)	(32.50)	(41.94)	(40.99)			(31.54)	(32.50)
Daily goal feedback[b]							64.39**	62.81**		
							(30.68)	(29.51)		
Total goal		0.18***		0.19***		0.12*		0.20***	0.23***	
		(0.05)		(0.04)		(0.07)		(0.04)		(0.05)
Productivity	6.77	4.50	9.65**	7.46*	2.88	2.67	14.38***	12.05***	9.25**	6.69
	(5.95)	(5.69)	(4.64)	(4.48)	(4.71)	(4.83)	(3.86)	(3.77)	(4.54)	(4.22)
Female	-83.48**	-43.78	-49.69	-22.37	-20.58	-16.70	43.31	50.27*	-12.91	27.27
	(39.44)	(38.48)	(31.11)	(29.63)	(47.89)	(46.98)	(31.31)	(30.16)	(33.08)	(32.96)
Constant	99.40	-3.15	34.85	-73.25	132.46	42.54	-111.18*	-236.36***	22.77	-109.33
	(100.51)	(101.14)	(80.39)	(77.95)	(84.07)	(82.18)	(66.05)	(64.78)	(78.89)	(82.57)
R^2	0.04	0.09	0.04	0.10	0.01	0.04	0.11	0.18	0.04	0.13
N	155	155	230	230	91	91	150	150	152	152

Notes. Dependent variable: Tables counted on Monday. OLS coefficient with robust standard error in parenthesis (only 8 out of the 397 subjects in the treatments with goal setting counted 1000 tables on Monday). $p < 0.10$, $**p < 0.05$, $***p < 0.01$. [a]Dummy for daily goal (i.e., dummy for treatment being *Daily* or *DailyCommitment*). [b]Dummy for daily goal feedback format (i.e., dummy for treatment *Daily*).

B Proofs

B.1 Proof of Proposition 2

Solving backward, we start with the behavior of self T. If all previous selves chose e_0^*, then the problem of self T would look exactly like the problem under narrow goals. That is, self T would provide e_0^*. Now suppose that at least one previous self $t < T$ worked less hard than e_0^* and that $\sum_{t=1}^{T-1} e_t + e_0^* < G = T\, e_0^*$. The derivative of the utility of self T for effort levels e_T at which the goal is not yet reached (i.e., $e_T < G - \sum_{t=1}^{T-1} e_t$) is $\beta\,[b'(e_T) + 1] - c'(e_T)$, which is strictly positive for $e_T < e_{max}$, defined in equation (4), and strictly negative for $e_T > e_{max}$. Thus, self T responds to deviations by previous selves with $e_T = \min\{G - \sum_{t=1}^{T-1} e_t, e_{max}\}$. We next show that some self $t < T$ has an incentive to deviate from $e_t = e_0^*$, given the response of self T to such a deviation. Specifically, we show that self $T-1$ has an incentive to deviate if none of the previous selves already deviated. Note that $e_{max} > e_0^*$ implies that for a "small deviation" by self $T-1$, $T\, e_0^* = G < (T-2)\, e_0^* + e_{T-1} + e_{max}$. That is, for a small deviation, self T will fully make up for the shortfall of self $T-1$ and $d\, e_T / d\, e_{T-1} = -1$. Considering a marginal deviation from the preferred effort of self 0, e_0^*, the left-derivative of the utility of self $T-1$ at decision $e_{T-1} = e_0^*$ is:

$$\beta\, b'(e_{T-1}) - c'(e_{T-1}) + \beta\, \underbrace{[b'(e_T) - c'(e_T)]}_{=0 \text{ at } e_T = e_0^*} \frac{d\, e_T}{d\, e_{T-1}} < 0.$$

That is, deviating from e_0^* by lowering effort e_{T-1} increases the utility of self $T-1$. Hence, e_0^* is not implementable in each period with a broad goal.

B.2 Proof of Proposition 3

We prove proposition 3 in several steps. We first show that the individual achieves his goal $T\, e_0^*$ (lemmas 1 and 2). Then we characterize the effort pattern (lemmas 4 and 5). Combining lemmas 2-5 gives proposition 3.

Lemma 1 *Suppose that reaching the goal G is still feasible in period t, i.e., $G - \sum_{\tau=1}^{t-1} e_\tau \leq (T - t + 1)\, e_{max}$. Then it is never optimal for self t to choose some e_t for which future selves cannot make up for the shortfall, which would be the case if $G > (T - t)\, e_{max} + e_t + \sum_{\tau=1}^{t-1} e_\tau$.*

Proof.

From the proof of proposition 2 it follows that each self will make up for a short fall in effort up to at most e_{max}. Hence, if $G - e_t - \sum_{\tau=1}^{t-1} e_\tau > (T-t)\, e_{max}$ future selves would not fully make up for the shortfall of self t and the individual would face a loss from not meeting his goal. The utility of self t for an effort level e_t that leads to a loss is

$$\beta\, b(e_t) - c(e_t) + (T-t)\,\beta\,(b(e_{max}) - c(e_{max})) + \beta\,\mu \left(e_t + (T-t)\, e_{max} + \sum_{\tau=1}^{t-1} e_\tau - G \right).$$

This utility is strictly increasing in e_t for $e_t < e_{max}$, as long as $G > (T-t)\, e_{max} + e_t + \sum_{\tau=1}^{t-1} e_\tau$ (see proof of proposition 2). Thus, e_t would be chosen so that reaching the goal G is still feasible. ■

Lemma 2 *The individual exactly achieves the goal* $G = T \min\{e_0^*, e_{max}\}$, *i.e.,* $\sum_{t=1}^{T} e_t = G$.

Proof.

As $e_0^* \leq e_{max}$, the goal is still achievable when self 1 chooses e_1. It follows from lemma 1 that each self $t < T$ will choose e_t such that $G \leq e_t + (T-t)\, e_{max} + \sum_{\tau=1}^{t-1} e_\tau$. Hence, from the perspective of self t, the goal G will either be achieved or overachieved. Overachievement is never optimal from the perspective of any self, because $e_t^* < e_0^*$, and future selves would lower effort in response to an effort by self t that would lead to overachievement. Thus, the goal will be exactly achieved. ■

Lemma 3 *Suppose* $G < e_{max}$. *Then,* $\frac{d\,e_t}{de_\tau} \leq 0$ *for all* $t, \tau \in \{1, \ldots, T\}$, $\tau < t$, *with strict inequality for interior solutions* $e_t < e_{max}$.

Proof.

The first-order condition (12) for self $t < T$ for an interior solution $e_t < e_{max}$ is an implicit function from which we get

$$\frac{d\,e_t}{d\,e_\tau} = \sum_{k=t+1}^{T} \left[\underbrace{\frac{\beta\,[b''(e_k) - c''(e_k)] \left(-\frac{d\,e_k}{d\,e_t}\right)}{\beta\, b''(e_t) - c''(e_t)}}_{\equiv \phi(e_k, e_t)} \left(\frac{d\,e_k}{d\,e_\tau}\right) \right] \quad \text{for } \tau < t. \tag{5}$$

Note that $\beta\,[b''(e_k) - c''(e_k)]/[\beta\, b''(e_t) - c''(e_t)] > 0$ because $b''(\cdot) \leq 0$ and $c''(\cdot) \geq 0$, with one inequality strict. Moreover, lemma 2 implies that

$$\sum_{\tau=t+1}^{T} \frac{d\,e_\tau}{d\,e_t} = -1. \tag{6}$$

We now show that for $e_t < e_{max}$ we have $\frac{d e_t}{d e_\tau} < 0$ for all $t, \tau \in \{1, \ldots, T\}$, $\tau < t$.

Step 1. Note that $\frac{d\,e_T}{d e_{T-1}} = -1$ implies $\phi(e_T, e_{T-1}) > 0$. Setting $t = T-1$ in (5) gives

$$\frac{d\,e_{T-1}}{d\,e_\tau} \quad = \quad \phi(e_T, e_{T-1}) \left(\frac{d\,e_T}{d\,e_\tau}\right) \quad \text{for } \tau < T-1,$$

which therefore implies that

$$\text{sign}\left(\frac{d\,e_{T-1}}{d\,e_\tau}\right) = \text{sign}\left(\frac{d\,e_T}{d\,e_\tau}\right) \quad \text{for } \tau < T-1. \tag{7}$$

Setting $t = T-2$ in (6), we have

$$\frac{d\,e_{T-1}}{d\,e_{T-2}} + \frac{d\,e_T}{d\,e_{T-2}} = -1. \tag{8}$$

Together, (7) and (8) imply that $\frac{d\,e_t}{d\,e_{T-2}} < 0$ for $t > T-2$.

Step 2. Setting $t = T-2$ in (5) gives

$$\frac{d\,e_{T-2}}{d\,e_\tau} \quad = \quad \phi(e_{T-1}, e_{T-2}) \underbrace{\left(\frac{d\,e_{T-1}}{d\,e_\tau}\right) + \phi(e_T, e_{T-2}) \left(\frac{d\,e_T}{d\,e_\tau}\right)}_{\text{same sign (by (7))}} \quad \text{for } \tau < T-2. \tag{9}$$

From step 1 we know that $\phi(e_{T-1}, e_{T-2}) > 0$ and $\phi(e_T, e_{T-2}) > 0$, which together with (9) imply that

$$\text{sign}\left(\frac{d\,e_{T-2}}{d\,e_\tau}\right) = \text{sign}\left(\frac{d\,e_{T-1}}{d\,e_\tau}\right) = \text{sign}\left(\frac{d\,e_T}{d\,e_\tau}\right) \quad \text{for } \tau < T-2.$$

Setting $t = T-3$ in (6),

$$\frac{d\,e_{T-2}}{d\,e_{T-3}} + \frac{d\,e_{T-1}}{d\,e_{T-3}} + \frac{d\,e_T}{d\,e_{T-3}} = -1,$$

and using that all terms on the left-hand side have the same sign, we get $\frac{d\,e_t}{d\,e_{T-3}} < 0$ for $t > T-3$.

Step 3. Continuing the iteration, plugging $t < T$ into (5), we obtain

$$\frac{d\,e_t}{d\,e_\tau} = \sum_{k=t+1}^{T} \underbrace{\phi(e_k, e_t)}_{\substack{>0 \\ \text{(by prev. step)}}} \underbrace{\left(\frac{d\,e_k}{d\,e_\tau}\right)}_{\substack{\text{same sign} \\ \text{(by prev. step)}}} \qquad \text{for } \tau < t.$$

This means that all terms on the left-hand side of (6) have the same sign, which implies that $\frac{d\,e_t}{d\,e_\tau} < 0$ for $t > \tau$. By extension, for corner solutions $e_t = e_{max}$, we have $\frac{d\,e_t}{de_\tau} \leq 0$. ■

Lemma 4 *Suppose $G < T\,e_{max}$. Effort is (weakly) increasing over time: $e_1 < e_2 \leq e_3 \leq \cdots \leq e_T \leq e_{max}$.*

Proof.

It follows from lemma 1 that each self $t < T$ will choose e_t such that $G \leq e_t + (T-t)\,e_{max} + \sum_{\tau=1}^{t-1} e_\tau$. We solve backward. Anticipating the behavior of self T, self $T-1$ maximizes

$$\beta\,b(e_{T-1}) - c(e_{T-1}) + \beta\left[b\Bigg(\underbrace{G - e_{T-1} - \sum_{t=1}^{T-2} e_t}_{=e_T}\Bigg) - c\left(G - e_{T-1} - \sum_{t=1}^{T-2} e_t\right)\right],$$

yielding the first-order condition for an interior solution $e_{T-1} < e_{max}$:

$$\beta\,b'(e_{T-1}) - c'(e_{T-1}) = \beta\,[b'(e_T) - c'(e_T)]. \tag{10}$$

As $\beta\,b'(e) - c'(e) < \beta\,[b'(e) - c'(e)]$, it follows that either $e_{T-1} < e_T$ or we have a corner solution $e_{T-1} = e_T = e_{max}$. Similarly, the first-order condition of self $T-2$ for an interior solution $e_{T-2} < e_{max}$ is given by:

$$\begin{aligned}&\beta\,b'(e_{T-2}) - c'(e_{T-2}) \\ &= \beta\,[b'(e_T) - c'(e_T)]\left(-\frac{d\,e_T}{d\,e_{T-2}}\right) + \beta\,[b'(e_{T-1}) - c'(e_{T-1})]\left(-\frac{d\,e_{T-1}}{d\,e_{T-2}}\right).\end{aligned} \tag{11}$$

Lemma 2 implies that $\frac{d\,e_{T-1}}{d\,e_{T-2}} + \frac{d\,e_T}{d\,e_{T-2}} = -1$. Hence, if $e_{T-1} = e_T = e_{max}$, then $\beta\,b'(e) - c'(e) < \beta\,(b'(e) - c'(e))$ implies that $e_{T-2} < e_{T-1}$, or we have a corner solution $e_{T-2} = e_{T-1} = e_T =$

e_{max}. Now if we have an interior solution $e_{T-1} < e_{max}$, we can substitute from (10)

$$\begin{aligned}
&\beta\, b'(e_{T-2}) - c'(e_{T-2}) \\
&= \beta\, b'(e_{T-1}) - c'(e_{T-1}) \left(-\frac{d\, e_T}{d\, e_{T-2}}\right) + \beta\, [b'(e_{T-1}) - c'(e_{T-1})] \left(-\frac{d\, e_{T-1}}{d\, e_{T-2}}\right) \\
&> \beta\, b'(e_{T-1}) - c'(e_{T-1}).
\end{aligned}$$

To understand the last inequality note that by lemma 3 we have $\frac{d\,e_T}{d\,e_{T-2}} \leq 0$ and $\frac{d\,e_{T-1}}{d\,e_{T-2}} < 0$, and in addition $\frac{d\,e_{T-1}}{d\,e_{T-2}} + \frac{d\,e_T}{d\,e_{T-2}} = -1$ (by lemma 2). We conclude from both cases that either $e_{T-2} < e_{T-1} \leq e_{max}$ or we have a corner solution $e_{T-2} = e_{T-1} = e_T = e_{max}$

Continuing the backward induction procedure using the first-order condition for self $\tau < T$ for interior solutions,

$$\beta\, b'(e_\tau) - c'(e_\tau) = \sum_{t=\tau+1}^{T} \left[\beta\,(b'(e_t) - c'(e_t)) \left(-\frac{d\,e_t}{d\,e_\tau}\right)\right], \tag{12}$$

while applying that $\sum_{t=\tau+1}^{T} \frac{d\,e_t}{d\,e_\tau} = -1$, gives $e_1 \leq \cdots \leq e_T \leq e_{max}$. Equality arises only if $e_T = e_{max}$ and then a corner solution for the effort may arise for a number of days leading up to T: $e_{\underline{t}} = \cdots = e_T = e_{max}$, where $\underline{t} > 1$ because $G < T\,e_{max}$. ∎

Lemma 5 *Suppose $G = T\,e_0^* < T\,e_{max}$. Self T works more than is optimal from the perspective of self 0 and self 1 works less: $e_T > e_0^*$ and $e_1 < e_0^*$.*

Proof.

In the proof of proposition 2 we showed that $e_T > e_0^*$. From lemma 4, we know that $e_1 < e_2 \leq \cdots \leq e_T \leq e_{max}$. If all selves $t > 1$ provide e_{max}, then $e_1 < e_0^*$ as $G = T\,e_0^* < T\,e_{max}$. If only selves $t \geq \underline{t}$ provide e_{max}, then it follows from the proof of lemma 4 that $e_1 < \cdots < e_{\underline{t}-1} < e_{\underline{t}} = \cdots = e_T = e_{max}$. ∎

Lemma 6 $\sum_{t=1}^{T} \frac{d\,e_t}{d\,G} = 1$ *and* $0 \leq \frac{d\,e_t}{d\,G} \leq 1$. *For $G < T\,e_{max}$ we have $\frac{d\,e_1}{d\,G} > 0$. If, in addition, $\beta\, b'''(e) - c'''(e) \leq 0$ and $b'''(e) - c'''(e) \leq 0$, then there exists $\underline{t} \in \{2, \ldots, T+1\}$ such that $e_{\underline{t}-1} < e_{max}$ and $\frac{d\,e_{\underline{t}-1}}{d\,G} > \frac{d\,e_{\underline{t}-2}}{d\,G} > \cdots > \frac{d\,e_1}{d\,G}$.*

Proof.

Let $v_t \equiv \beta\, b(e_t) - c(e_t)$ and $w_t \equiv \beta\, [b(e_t) - c(e_t)]$. Taking the total derivative of the first-order condition (12), and noting that $\frac{d^2 e_t}{d e_\tau \, dG} = 0$,[16] we get

$$\frac{d e_{T-t}}{dG} = \sum_{\tau=T-(t-1)}^{T} w''_\tau \left[\frac{\left(-\frac{d e_\tau}{d e_{T-t}}\right) \frac{d e_\tau}{dG}}{v''_{T-t}} \right]$$

Recursively plugging in yields:

$$\begin{aligned}
\frac{d e_{T-1}}{dG} &= \frac{w''_T}{v''_{T-1}} \underbrace{\left(-\frac{d e_T}{d e_{T-1}}\right)}_{=1} \frac{d e_T}{dG}, \\
\frac{d e_{T-2}}{dG} &= \frac{w''_{T-1}}{v''_{T-2}} \left(-\frac{d e_{T-1}}{d e_{T-2}}\right) \frac{d e_{T-1}}{dG} + \frac{w''_T}{v''_{T-2}} \left(-\frac{d e_T}{d e_{T-2}}\right) \frac{d e_T}{dG}, \\
\frac{d e_{T-3}}{dG} &= \frac{w''_{T-2}}{v''_{T-3}} \left(-\frac{d e_{T-2}}{d e_{T-3}}\right) \frac{d e_{T-2}}{dG} + \frac{w''_{T-1}}{v''_{T-3}} \left(-\frac{d e_{T-1}}{d e_{T-3}}\right) \frac{d e_{T-1}}{dG} + \frac{w''_T}{v''_{T-3}} \left(-\frac{d e_T}{d e_{T-3}}\right) \frac{d e_T}{dG}, \\
\frac{d e_{T-4}}{dG} &= \frac{w''_T}{v''_{T-4}} \frac{d e_T}{dG} \Bigg[-\frac{d e_T}{d e_{T-4}} - \frac{w''_{T-1}}{v''_{T-1}} \frac{d e_{T-1}}{d e_{T-4}} - \frac{w''_{T-2}}{v''_{T-2}} \frac{d e_{T-2}}{d e_{T-4}} \left(-\frac{d e_T}{d e_{T-2}} - \frac{w''_{T-1}}{v''_{T-1}} \frac{d e_{T-1}}{d e_{T-2}} \right),
\end{aligned}$$

Continuing in this way and noting that $\frac{d e_t}{d e_\tau} \le 0$ for $\tau < t$ (lemma 3) gives that either $\frac{d e_t}{dG} = 0$ or $\text{sign}\left(\frac{d e_t}{dG}\right) = \text{sign}\left(\frac{d e_{t+1}}{dG}\right)$. Further, from $\sum_{t=1}^{T} e_t = G$ it follows that $\sum_{t=1}^{T} \frac{d e_t}{dG} = 1$. Since all derivatives have the same sign, or are zero in case of a corner solution, and since they sum up to one, it follows that each derivative must lie between 0 and 1. From lemma 4 it follows that for $G < T\, e_{max}$ we have an interior solution $e_1 < e_{max}$ and hence $\frac{d e_1}{dG} > 0$.

We next show that for interior solutions $e_T < e_{max}$, we have $\frac{d e_T}{dG} > \frac{d e_{T-1}}{dG} > \cdots > \frac{d e_1}{dG}$. First of all note that $\frac{w''_t}{v''_t} < 1$ because $v''(e_t) < w''(e_t) < 0$, $e_t > e_{t-\tau}$, and $w'''(\cdot), v'''(\cdot) \le 0$. Moreover, $\sum_{t=\tau+1}^{T} \left(-\frac{d e_t}{d e_\tau}\right) = 1$, for $\tau < t$. Using this and the fact that $-\frac{d e_t}{d e_\tau} > 0$ in the recursive definition of $\frac{d e_{T-t}}{dG}$ above gives the result. Taking account of possible corner solutions, we get that there exists $\underline{t} \in \{2, \ldots, T+1\}$ such that $e_{\underline{t}-1} < e_{max}$ (lemma 4) and $\frac{d e_{\underline{t}-1}}{dG} > \frac{d e_{\underline{t}-2}}{dG} > \cdots > \frac{d e_1}{dG}$. ■

B.3 Proof of Proposition 4

We prove proposition 4 in several steps.

[16] This is because loss utility is linear

Interior solutions ($e_t < e_{max}$)

Self 0 maximizes his utility $\beta\left(\sum_{t=1}^{T} b(e_t^b(G)) - c(e_t^b(G))\right)$ by choosing a *broad* goal G, which then determines for all dates $t = 1, \ldots, T-1$ the effort $e_t^b(G)$ through the system of first-order conditions (12). The effort $e_T^b(G)$ is then pinned down by $\sum_{t=1}^{T} e_t^b(G) = G$ (by lemma 2, because $G \leq T e_0^*$). The first-order condition for the optimal goal G^* is given by:

$$\beta \sum_{t=1}^{T} \left[\left(b'(e_t^b(G^*)) - c'(e_t^b(G^*)) \right) \frac{d\, e_t^b(G^*)}{d\, G} \right] = 0. \tag{13}$$

We now proceed to restate (13) by substituting in from the first-order conditions of the future selves $t > 0$. To facilitate exposition, we write e_t instead of $e_t^b(G)$. Rearranging (10) yields:

$$\beta\,[b'(e_{T-1}) - c'(e_{T-1})] = \beta\,[b'(e_T) - c'(e_T)] + (1-\beta)\, c'(e_{T-1}). \tag{14}$$

Rearranging (11), using (14) and the fact that $\frac{d\,e_T}{d\,e_{T-2}} + \frac{d\,e_{T-1}}{d\,e_{T-2}} = -1$ (by lemma 2), gives

$$\begin{aligned}
&\beta\,[b'(e_{T-2}) - c'(e_{T-2})] \\
&\quad = \beta\,[b'(e_T) - c'(e_T)] + (1-\beta)\, c'(e_{T-1}) \left(-\frac{d\,e_{T-1}}{d\,e_{T-2}} \right) + (1-\beta)\, c'(e_{T-2}).
\end{aligned}$$

Similarly, for self $T-3$ we get:

$$\begin{aligned}
\beta\,[b'(e_{T-3}) - c'(e_{T-3})] &= \beta\,[b'(e_T) - c'(e_T)] \cdot (-1) \cdot \left(\frac{d\,e_T}{d\,e_{T-3}} + \frac{d\,e_{T-1}}{d\,e_{T-3}} + \frac{d\,e_{T-2}}{d\,e_{T-3}} \right) \\
&+ (1-\beta)\, c'(e_{T-1}) \left[\left(-\frac{d\,e_{T-1}}{d\,e_{T-3}} \right) + \left(-\frac{d\,e_{T-1}}{d\,e_{T-2}} \right) \left(-\frac{d\,e_{T-2}}{d\,e_{T-3}} \right) \right] \\
&+ (1-\beta)\, c'(e_{T-2}) \left(-\frac{d\,e_{T-2}}{d\,e_{T-3}} \right) + (1-\beta)\, c'(e_{T-3}).
\end{aligned}$$

This simplifies to:

$$\begin{aligned}
&\beta\,[b'(e_{T-3}) - c'(e_{T-3})] \\
&\quad = \beta\,[b'(e_T) - c'(e_T)] + (1-\beta)\, c'(e_{T-2}) \left(-\frac{d\,e_{T-2}}{d\,e_{T-3}} \right) + (1-\beta)\, c'(e_{T-3}).
\end{aligned}$$

Similarly, for self $T-4$ we get:

$$\begin{aligned}
\beta\,[b'(e_{T-4}) - c'(e_{T-4})] &= \beta\,[b'(e_T) - c'(e_T)] \\
&+ (1-\beta)\, c'(e_{T-1}) \left[\left(-\frac{d\,e_{T-1}}{d\,e_{T-4}} \right) + \left(-\frac{d\,e_{T-1}}{d\,e_{T-2}} \right) \left(-\frac{d\,e_{T-2}}{d\,e_{T-4}} \right) \right] \\
&+ (1-\beta)\, c'(e_{T-2}) \left[\left(-\frac{d\,e_{T-2}}{d\,e_{T-4}} \right) + \left(-\frac{d\,e_{T-2}}{d\,e_{T-3}} \right) \left(-\frac{d\,e_{T-3}}{d\,e_{T-4}} \right) \right] \\
&+ (1-\beta)\, c'(e_{T-3}) \left(-\frac{d\,e_{T-3}}{d\,e_{T-4}} \right) + (1-\beta)\, c'(e_{T-4}).
\end{aligned}$$

This simplifies to:

$$\beta\,[b'(e_{T-4}) - c'(e_{T-4})] \\ = \beta\,[b'(e_T) - c'(e_T)] + (1-\beta)\,c'(e_{T-3})\left(-\frac{d\,e_{T-3}}{d\,e_{T-4}}\right) + (1-\beta)\,c'(e_{T-4}).$$

Continuing in this way we get for $\tau = 2, \ldots, T-1$:

$$\beta\,[b'(e_{T-\tau}) - c'(e_{T-\tau})] \\ = \beta\,[b'(e_T) - c'(e_T)] + (1-\beta)\,c'(e_{T-\tau+1})\left(-\frac{d\,e_{T-\tau+1}}{d\,e_{T-\tau}}\right) + (1-\beta)\,c'(e_{T-\tau}). \quad (15)$$

Plugging (15) into (13) and rearranging using $\sum_{t=1}^{T} \frac{d\,e_t}{d\,G} = 1$, yields:

$$\beta\,[b'(e^b_T(G^*)) - c'(e^b_T(G^*))]\sum_{t=1}^{T}\frac{d\,e^b_t(G^*)}{d\,G} + (1-\beta)\left(\sum_{t=1}^{T-2} c'(e^b_{t+1}(G^*))\,\frac{d\,e^b_{t+1}(G^*)}{d\,e^b_t(G^*)}\,\frac{d\,e^b_t(G^*)}{d\,G}\right)$$

$$+(1-\beta)\left(\sum_{t=1}^{T} c'(e^b_t(G^*))\,\frac{d\,e^b_t(G^*)}{d\,G}\right) = 0$$

$$\Leftrightarrow \quad \beta\,[b'(e^b_T(G^*)) - c'(e^b_T(G^*))] + (1-\beta)\,c'(e^b_1(G^*))\,\frac{d\,e^b_1(G^*)}{d\,G} = 0. \quad (16)$$

By assumption, $e^*_0 < e_{max}$. By lemma 6, $\frac{d\,e^b_1(G^*)}{d\,G} > 0$. Thus, (16) together with the fact that $\beta\,[b'(e^*_0) - c'(e^*_0)] = 0$ and that $b'(e) - c'(e)$ is strictly decreasing, implies that $e_T > e^*_0$.[17] Substituting from (16) into (14), gives

$$\beta\,[b'(e_{T-1}(G^*)) - c'(e_{T-1}(G^*))] = (1-\beta)\left(c'(e_{T-1}(G^*)) - c'(e_1(G^*))\frac{d\,e_1(G^*)}{d\,G}\right) \quad (17)$$

From lemma 4 and $c''(\cdot) \geq 0$, it follows that $c'(e_{T-1}(G^*)) \geq c'(e_1(G^*))$, which together with the fact that $0 < \frac{d\,e_1(G^*)}{d\,G} \leq 1$ (by lemma 6) implies that the right-hand side of (17) is (weakly) positive. Hence, $e_{T-1} \leq e^*_0$. From lemma 4 it follows that $e_1 < e_2 \leq e_3 \leq \cdots \leq e_{T-1} \leq e^*_0 < e_T$.

Lemma 7 *Suppose $\beta\,b'''(e) - c'''(e) \leq 0$ and $b'''(e) - c'''(e) \leq 0$. Then, $T\,e^*_0 > \sum_t^T e^b_t(G)$, where $e^b_t(G^*)$ and G^* are characterized by (12) and (13).*

Proof.

Let $q(e) \equiv b(e) - c(e)$. From (13) and the fact that $q'(e^*_0) \equiv b'(e^*_0) - c'(e^*_0) = 0$, we get

$$\sum_{t=1}^{T}\left[q'(e^b_t(G^*))\,\frac{d\,e^b_t(G^*)}{d\,G}\right] = q'(e^*_0).$$

[17] For time-consistent preferences, i.e. $\beta = 1$, we have $e_T = e^*_0$.

Rewriting, using $\sum_{t=1}^{T} \frac{d\,e_t^b(G^*)}{d\,G} = 1$:

$$\begin{aligned} q'\left(\sum_{t=1}^{T} e_0^* \frac{d\,e_t^b(G^*)}{d\,G}\right) &= \sum_{t=1}^{T}\left[q'\left(e_t^b(G^*)\right)\,\frac{d\,e_t^b(G^*)}{d\,G}\right] \\ &\leq q'\left(\sum_{t=1}^{T} e_t^b(G^*)\frac{d\,e_t^b(G^*)}{d\,G}\right), \end{aligned}$$

where the last line follows from Jensen's inequality because $q'(\cdot)$ is concave. Hence, from $q''(\cdot) < 0$ it follows that

$$\sum_{t=1}^{T}(e_0^* - e_t^b(G^*))\,\frac{d\,e_t^b(G^*)}{d\,G} \geq 0.$$

Above we have shown that $e_T^b(G^*) > e_0^*$ and $e_t^b(G^*) \leq e_0^* \quad \forall t \in \{1, \ldots, T-1\}$, with strict inequality for $t = 1$. Hence, if $\frac{d\,e_T}{d\,G} = 0$, the result follows directly. If there is an interior solution e_T then $1 > \frac{d\,e_T}{d\,G} > \frac{d\,e_{T-1}}{d\,G} > \cdots > \frac{d\,e_1}{d\,G} > 0$ (by lemma 6) gives that:

$$\frac{d\,e_T^b(G^*)}{d\,G}\sum_{t=1}^{T}(e_0^* - e_t^b(G^*)) > \frac{d\,e_T}{d\,G}\sum_{t=1}^{T}(e_0^* - e_t^b(G^*)) \geq 0.$$

Hence, we conclude that

$$T\,e_0^* > \sum_{t=1}^{T} e_t^b(G^*).$$

■

Corner solutions

Lemma 8 *There may exist a corner solution for the effort in periods $\underline{t}, \ldots, T$, where $\underline{t} > 1$. The effort schedule then is $(e_1^{b'}, \ldots, e_{\underline{t}-1}^{b'}, e_{max}, \ldots, e_{max})$ with $e_1^{b'} < e_2^{b'} < \cdots < e_{\underline{t}-2}^{b'} < e_0^* < e_{\underline{t}-1}^{b'}$ and $e_t^{b'}$ characterized by*

$$\beta\,b'(e_\tau^{b'}) - c'(e_\tau^{b'}) = \sum_{t=\tau+1}^{\underline{t}-1}\left[\beta\,(b'(e_t^{b'}) - c'(e_t^{b'}))\,\left(-\frac{d\,e_t^{b'}}{d\,e_\tau^{b'}}\right)\right]. \tag{18}$$

Proof.

The result follows from lemma 4 and the following argument. If selves $\underline{t}, \ldots, T$ provide e_{max}, then from the perspective of self $\underline{t}-1$, the effort of future selves is fixed. So self $\underline{t}-1$ either sticks to his goal or makes-up for a previous shortfall in the same way as described for self T above. Hence, we can redo the backward induction procedure described above, just starting from period $\tau - 1$. ■

Implemented effort schedule

Lemma 9 *For* $\beta \to 1$, $U_0(e_1^b(G^*(\beta)), \ldots e_t^b(G^*(\beta))) > U_0(e_1^{b'}(G^*(\beta)), \ldots e_\tau^{b'}(G^*(\beta)), e_{max}, \ldots, e_{max})$. *Hence, self 0 prefers to implement* $(e_1^b, \ldots, e_t^b)$ *(characterized in lemma 7) rather than any other* $(e_1^{b'}, \ldots, e_{tau-1}^{b'}, e_{max}, \ldots, e_{max})$ *(characterized in lemma 8).*

Proof.

Note that $e_t^b(G^*(1)) = e_0^*$, while for $\beta = 1$ we have $e_{max} > e_0^*$. Hence, $U_0(e_1^b(G^*(1)), \ldots, e_T^b(G^*(1))) = U_0(e_0^*, \ldots, e_0^*) > U_0(e_1^{b'}, \ldots e_\tau^{b'}, e_{max}, \ldots, e_{max}) = U_0(e_0^*, \ldots, e_0^*, e_{max}, \ldots, e_{max})$. The result follows from the intermediate value theorem because the utility function is continuous in all arguments and e_{max} is a continuous, increasing function of β. ∎

Instructions[1]

[Participants can choose on each screen between English and Danish – below are the English instructions]

Week 1 (Goal setting)

Screen 1

Welcome to the third part of the scientific study on Aarhus University students' traits, behaviors and study outcomes.

By participating you can earn up to 500 kr.

Your tasks: Next week from Monday, [date] - 0:00h until Friday, [date] - 23:59h you have the opportunity to count in total up to 1000 tables – just like the tables you counted in the previous parts of this study. **You earn 50 øre for each table where you count the number of zeros correctly**. If you miscount a table, you will be asked to count it again.

Show an example table (click here).

Tables look like follows and once you have counted the number of zeros in a table, you should enter the number of zeros in that table into a field below the table.

1	0	0	1	1
0	0	1	0	1
0	0	0	0	1
1	1	0	1	1
0	0	1	0	1
0	0	0	0	1

How many zeros are in the table?

(17 is the correct answer for this table)

Close window

Each day at 0:00h you will receive an email with a personal link that allows you to log in and count tables. **You can count as many of the 1000 tables as you like.** Your answers will be automatically saved when you move

[1] Instructions shown are the ones administered through a larger online study, for which participants were recruited through an email call to all first-year students at the School of Business and Social Sciences. Instructions were subjects were recruited over the Cognition and Behavior Lab are analogous.

to a new screen, and you can use your personalized link from the email to return as often as you like from Monday, 30.09. - 0:00h until Friday, 04.10. - 23:59h.

To participate, you now have to complete the next two screens by setting goals for how much you want to work next week.

Payments: Like for the first parts of the study, Aarhus University will automatically transfer the amount you earn into your NemKonto. Alexander Koch and his team will start registering the payments with the administration of Aarhus University in week X ([date]-[date]). Then the administrative process might take between 2-6 weeks. You can contact Alexander Koch by email (akoch@econ.au.dk) if you want information on the payment process.

Taxes: According to Danish law, Aarhus University reports payments to the tax authorities. Please note that taxes might be deducted from the amount of money you earn. That is, the amount you will receive might be lower than the one stated.

- ○ Yes, I want to participate.
- ● No, thanks.

Screen 1 (Treatments DailyStart and WeeklyStart)

Same as above, just extra text on screen 1:

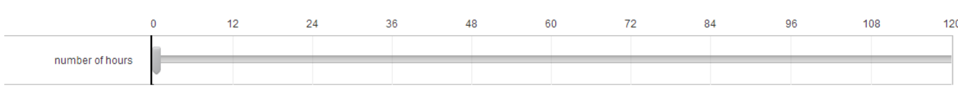
The only condition to be eligible to receive any payment (up to 500 kr.) is to log on at least once a day (Monday to Friday) and to correctly count at least one table every day. You get no payment for the first table in a day that you correctly count.

Screen 2

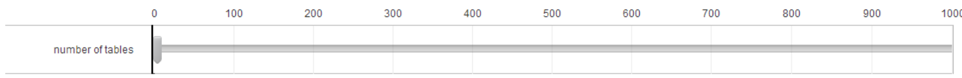
Next week you have the opportunity to count in total up to 1000 tables. **You earn 50 øre for each table where you count the number of zeros correctly. So all in all, you can earn up to 500 kr.**

On the next page you will set yourself a goal for how much you want to work next week.

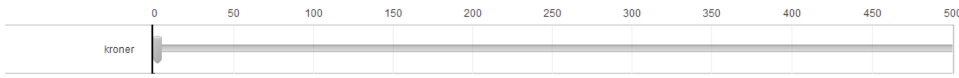
Before doing so, please take a moment to think about the following questions:
How much time do you think you have next week to work on this task?



How many tables do you think you can realistically manage to solve within that time?



How much money would you like to earn?



What you would like to do with the money that you earn over the next week?

Please write a short description here:

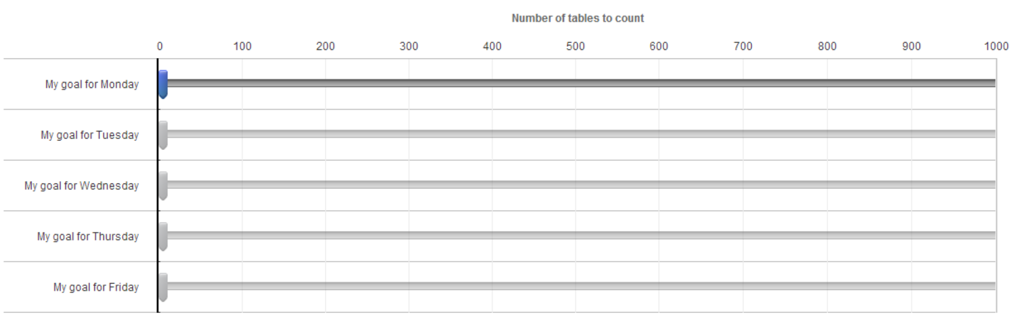
Screen 3 (Treatment Daily, Daily14, DailyAggregated)

Set goals!

Now set yourself a goal for how many tables to count on each weekday. Next week we will then remind you of your goals. But, of course, you are free to work as much as you want.

Remember:

- You can log in as often as you like with the personal link that you will receive in an email and count tables anytime from Monday, 30.09. - 0:00h until Friday, 04.10. - 23:59h.
- You can count up to 1000 tables in total over the five days.
- You earn 50 øre for each table where you count the number of zeros correctly.

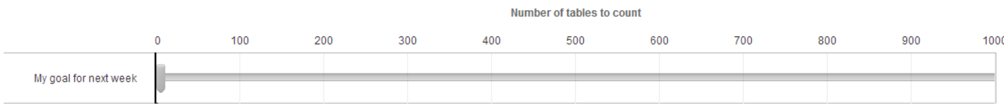


Screen 3 (Treatment Weekly)

Set a goal!

Now set yourself a goal for how many tables to count next week. Next week we will then remind you of your goal. But, of course, you are free to work as much as you want.

Remember: [as above]



Screen 3 (Treatments DailyStart and WeeklyStart)
Analogue to screens 3 above, but add last bullet to "Remember":

- The only condition to be eligible to receive any payment (up to 500 kr.) is to log on at least once a day (Monday to Friday) and to correctly count at least one table every day.

Screen 2 and 3 (Treatments NoGoal)
[These screens do not appear in this treatment.]

[As this treatment was not part of the larger online survey, written informed consent is given at this stage]

Screen 4
Thanks!

Your answers have been registered. Monday, 30.09. 0:00h you will receive an email with a personal link that allows you to log in and start counting tables.

Finish and Save

Week 2 (Work task)

Screen (Treatment Daily, Daily14)
Your goal for today: count [goal] tables.

So far you counted [counted tables] tables today.

You can count as many of the remaining [remaining tables] tables as you like. **You earn 50 øre for each table where you count the number of zeros correctly.**

Please count the number of zeros in the following table. Once you counted the table, please click ">>" to save your response. If you miscount the table, you will be asked to count it again. If you want to stop counting simply close the browser. You can continue counting until Friday, [date] - 23:59h by logging in with the personal link from the email you received.

[Table]

How many zeros are in the table?

Screen (Treatment Weekly)
Your goal for this week: count [goal] tables until Friday 23:59h.

So far you counted [counted tables] tables this week.

[Rest as above]

Screen (Treatment DailyAggregated)
[As for treatment Weekly]

Screen (Treatment NoGoal)
[As above. The line “Your goal for this week (…)” is deleted]

Screen (Treatment DailyStart, WeeklyStart)
Same as above, just extra text:

Remember that the condition to be eligible to receive any payment (up to 500 kr.) is to log on at least once a day (Monday to Friday) and to correctly count at least one table every day.

Email texts[2]

All emails had the following structures (below we only state the english versions of the main body):

Subject: [First Name]: Deltagelse i 3. del af den videnskabelige undersøgelse på Aarhus Universitet / Participation in 3rd part of the scientific study at Aarhus University

For an English version please see below

[Danish version]

[English version]

Invitation (Wednesday 00:00, week 1)

Dear [First Name Last Name],

Last week, you agreed to participate in the third part of the scientific study on students' traits, behaviors and study outcomes. **By participating you can earn up to 500 kr.**

To get started please click on the following link (or copy it into your internet browser) before 23:59h on Friday, [date]:

[Link]

Use a desktop computer, notebook or an iPad to participate in this study. Unfortunately, it is not possible to use a smartphone (such as an iPhone or BlackBerry).

Many thanks for participating in this study,
Alexander Koch (Institut for Økonomi, Aarhus Universitet)

Reminder (if incomplete, Friday 9:00, week 1)

Dear [First Name Last Name],

Last week, you agreed to participate in the third part of the scientific study on students' traits, behaviors and study outcomes. **By participating you can earn up to 500 kr.**

To get started please click on the following link (or copy it into your internet browser) before 23:59h tonight (Friday, [date]):

[2] Email texts shown are the ones administered through a larger online study, for which participants were recruited through an email call to all first-year students at the School of Business and Social Sciences. Instructions were subjects were recruited over the Cognition and Behavior Lab are analogous.

[Link]

Use a desktop computer, notebook or an iPad to participate in this study. Unfortunately, it is not possible to use a smartphone (such as an iPhone or BlackBerry).

Many thanks for participating in this study,
Alexander Koch (Institut for Økonomi, Aarhus Universitet)

Daily emails: Monday – Friday at 0:00, week 2 (Treatment Daily, Daily14)

Dear [FirstName LastName],

Last week, you agreed to participate in the third part of the scientific study on students' traits, behaviors and study outcomes.

You set yourself the goal to count [goal Monday] tables today (Monday, [date]).

To log in and count tables please click on the following link (or copy it into your internet browser):

[Link]

You can use your personalized link to return as often as you like until Friday, [date] - 23:59h. Use a desktop computer, notebook or an iPad to participate in this study. Unfortunately, it is not possible to use a smartphone (such as an iPhone or BlackBerry).

Many thanks for participating in this study,
Alexander Koch (Institut for Økonomi, Aarhus University)

Daily emails: Monday – Friday at 0:00, week 2 (Treatment Weekly)

As above except:

You set yourself the goal to count [goal Total] tables until Friday, [date] - 23:59h.

Daily emails: Monday – Friday at 0:00, week 2 (Treatment WeeklyStart)

Sorry if you have received this twice. But there have been some problems sending from an au.dk email to certain email addresses such as Hotmail (if you are interested, see all the way below for the message from IT). For that reason, I am sending this again from my gmail account, to be on the safe side.

Dear [First Name Last Name],

Last week, you agreed to participate in the third part of the scientific study on students' traits, behaviors and study outcomes.

You set yourself the goal to count [goal Monday] tables today (Monday, [date]).

Remember that you need to log on and count at least one table today! *

To log in and count tables please click on the following link (or copy it into your internet browser):

[Link]

* The only condition to be eligible to receive any payment (up to 500 kr.) is to log on at least once a day (Monday to Friday) and to correctly count at least one table every day. You get no payment for the first table in a day that you correctly count.

You can use your personalized link to return as often as you like until Friday, [date]- 23:59h. Use a desktop computer, notebook or an iPad to participate in this study. Unfortunately, it is not possible to use a smartphone (such as an iPhone or BlackBerry).

Many thanks for participating in this study,
Alexander Koch (Institut for Økonomi, Aarhus University)

Daily emails: Monday – Friday at 0:00, week 2 (Treatment WeeklyStart)

As above, except:

You set yourself the goal to count [goal Total] tables until Friday, [date] - 23:59h.

Daily emails: Monday – Friday at 0:00, week 2 (Treatment NoGoal)

As above, except:

[The sentence "You set yourself the goal to count (…)" is deleted]

Daily emails: Monday – Friday at 0:00, week 2 (Treatment DailyAggregated)

As for treatment Weekly.

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2016-08: Rune V. Lesner: The Long-Term Effect of Childhood Poverty

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