Should Individuals Choose their own Incentives? Evidence from a Mindfulness Meditation Intervention*

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Abstract

Traditionally, incentives to promote behavioral change are assigned rather than chosen. In this paper, we theoretically and empirically investigate the alternative approach of letting people choose their own incentives from a menu of increasingly challenging and rewarding options. When individuals are heterogeneous and have private information about their costs and benefits, we theoretically show that leaving them the choice of incentives can improve both adherence and welfare. We test the theoretical predictions in a field experiment based on daily meditation sessions. We randomly assign some participants to one of two incentive schemes and allow others to choose between the two schemes. As predicted, participants sort into schemes in (partial) agreement with the objectives of the policy maker. However, in contrast to our prediction, participants who could choose complete significantly fewer sessions than participants that were randomly assigned. Since the results are not driven by poor selection, we infer that letting people choose between incentive schemes may bring in psychological effects that discourage adherence.

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JEL classification: C9; D03; D8; I1.

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1 Introduction

Monetary incentives have proven to help individuals lead healthier lifestyles (e.g. Giné et al., 2010; Royer et al., 2015; Augurzky et al., 2018; Schilbach, 2019; Carrera et al., 2020; Campos-Mercade et al., 2021; Aggarwal et al., 2023; Brownback et al., 2023). They are motivated by ample evidence that individuals do not always behave in their best interest (due to time-inconsistent preferences or self-control problems), or do not account for the externalities of a healthy lifestyle. Traditionally in this field, policy makers have offered a single incentive scheme (e.g. Charness and Gneezy, 2009; Acland and Levy, 2015 (März, 2019); Fricke et al., 2018; Bachireddy et al., 2019). However, one size may not fit all when individuals are heterogeneous. For example, incentives could become more effective when tailored to the individual cost and benefits different agents derive from the incentivized behavior. Moreover, informational asymmetries are often in place: While individuals have a good understanding of their cost-benefit ratio, the policy maker rarely knows individuals' types. Thus, it may not be feasible to assign tailored incentives to different individuals.

Crucially, well-designed incentives can allow the policy maker to extract and leverage this information in an incentive-compatible way. Borrowing intuitions from the mechanism and contract design literature (e.g. Mirrlees, 1971; Spence, 1974), we ask whether the policy maker can extract individuals' private information by letting them choose among schemes, and whether this can in turn lead to more effective incentives.[1] More specifically, we study whether giving people the choice between incentives that are ranked in terms of their challenge and reward increases adherence compared to the traditional approach of exogenous assignment. Our paper combines theoretical analysis and empirical results. We derive a model highlighting the conditions under which letting individuals choose between incentive schemes leads to higher adherence. We then test our theoretical predictions with a field experiment on mindfulness meditation.[2]

[1] Next to extracting private information, choice might also increase adherence due to agency or psychological ownership effects (Bartling et al., 2014; Fehr et al., 2013; Dawkins et al., 2017).

[2] Mindfulness meditation is a mental health practice that involves a present-moment orientation and trains an accepting attitude towards one's experience. Cassar et al. (2022) and Charness et al. (2024) find a positive effect for a mindfulness meditation program on incentivized cognitive tasks as well as self-reported measures of mental well-being. Recent meta-analyses further suggest that mindfulness-based interventions can improve outcomes related to stress, depression and anxiety, insomnia, chronic pain, smoking cessation, weight loss, and other clinically relevant outcomes (Goyal et al., 2014; Khoury et al., 2015; Gong et al., 2016; Carrière et al., 2018; Goldberg et al., 2018; Heckenberg et al., 2018; Reangsing et al., 2020; Scott-Sheldon et al., 2020; Wang et al., 2020).

We model agents that are heterogeneous along several dimensions: meditation benefits, opportunity costs of meditating, and degree of actual and perceived time inconsistency. The policy maker wishes to increase the average frequency of meditation sessions, or (in an extension of the model) aggregate welfare. She has two incentive schemes at her disposal: a low-challenge-low-reward piece-rate scheme, called Constant, and a high-challenge-high-reward scheme, called Streak, that pays agents a larger per-session reward for the completion of a number of consecutive meditation sessions.[3] While both schemes improve adherence compared to baseline, we show that the first-best allocation follows a threshold strategy that assigns the easier Constant scheme to agents with low meditation benefits, and the Streak scheme to high-benefit agents. Individuals' types are private knowledge, making the exogenous assignment of the first-best allocation unfeasible.[4] Our main theoretical contribution is twofold. First, we show that, when given the choice, individuals sort in the two schemes in partial accordance with the first-best allocation.[5] Second, we show that, despite this partial misalignment, under specific and verifiable conditions, letting agents choose their incentives improves adherence and welfare more than exogenous allocation.[6]

Our results do not hinge on the policy maker choosing the menu of schemes optimally, a goal that is often unfeasible in real-world scenarios marked by many unobservables. Instead, we leverage a more general and verifiable single-crossing property such that the low-challenge-low-reward scheme rewards relatively more for low completion rates while the high-challenge-high-reward scheme rewards relatively more for high completion rates. Indeed, while we formalize a simple setting with two incentive schemes, we think our model can easily generalize to other sets of incentive schemes that satisfy the single crossing

[3] Constant incentives are arguably the simplest and most utilized form of incentives, and thus extensively studied. We combined them with Streak schemes for two reasons. First, Streak schemes provide extra monetary incentives in every period. In contrast, alternative dynamic schemes such as threshold incentive schemes, do not offer further extra incentives when the threshold is out of reach or already met. Second, streaks are often used to motivate people in practice, in particular on popular mobile applications, such as Duolingo or Snapchat.

[4] Alternatively, the policy maker may know the individual type, but it may be politically unfeasible to exogenously assign different schemes to different individuals.

[5] High-benefit individuals choose the Streak scheme and low-benefit individuals choose the Constant scheme. However, the threshold chosen by the individuals is not the first-best threshold: Too many individuals select into the easier Constant scheme than would be optimal. In fact, the suboptimality of the threshold could even backfire and lead to lower meditation frequencies than under the exogenous allocation.

[6] One sufficient condition (which we exploit in our experiment) is that the Constant scheme leads to weakly higher expected meditation frequency than the Streak scheme. This is verifiable if the policy maker has historical data regarding the performance of the schemes in a comparable population.

property.

We test the predictions of our model with a field experiment involving 499 students at the University of Amsterdam. Students took part in a 36-day mindfulness meditation program consisting of short, daily, online meditation sessions. We randomize subjects into three treatments: *Control*, *Random* and *Choice*. In all treatments, subjects receive access to meditation audio files. Subjects in *Random* and *Choice* are additionally paid for completing meditation sessions. In *Random*, subjects are randomly allocated to either a Constant or Streak incentive scheme. In *Choice*, subjects can choose between the Constant and Streak incentive scheme. The Constant scheme pays subjects €2 for each day that they successfully complete that day's meditation session. The Streak scheme pays subjects €8 for each series of three days in which they consecutively complete the day's meditation session.[7]

Our results partially align with our model's predictions. As expected, both the Constant and Streak scheme significantly increase average meditation frequency compared to the control group, and do so almost to the same extent. Further, subjects with high perceived meditation benefits meditate more when randomly assigned to the Streak incentive scheme, and vice versa. We also find that subjects in *Choice* partially separate in accordance with their expected meditation frequency. Contrary to our theoretical predictions, however, subjects who chose their incentive scheme meditated significantly *less* than subjects who were randomly assigned. This surprising effect is entirely driven by subjects who did not meditate at baseline. After showing that poor selection is unlikely to explain the negative effect of *Choice*, we residually speculate that this negative effect may come from the act of choosing itself. We highlight potential psychological channels through which this can happen in an exploratory analysis. We find some support for a demotivating effect via self-signaling, and find no evidence in favor of other potential explanations, namely regret aversion and differences in presentation.

Our paper thus shows that monetary incentives can be a viable tool to increase meditation frequency. On top of this, our general theory allowing for multi-dimensional heterogeneity as well as sophisticated and naive time-inconsistency predicts that having participants choose their incentives outperforms exogenous assignment. While the theory

[7] We used a 3-day streak to make the Streak scheme notably different from the Constant scheme, while trying to ensure that participants stayed motivated enough to start a new streak if they failed to complete their current streak.

predicts that choice should increase adherence, our experimental results show that letting people choose might actually backfire.

The remainder of the paper is structured as follows. The following section discusses the related literature. Section 2 provides theoretical predictions for the experimental results. Section 3 presents the experimental design. Section 4 shows and discusses the experimental results. Section 5 investigates potential explanations for the negative net effect of *Choice* on meditation frequency. Finally, Section 6 concludes.

1.1 Contribution to the Literature

Our paper contributes to four strands of the literature. The first is work investigating how monetary incentives can promote behavioral change for better health in various areas such as physical activity, weight loss, and smoking (see e.g. Volpp et al., 2008; Charness and Gneezy, 2009; Giné et al., 2010; Halpern et al., 2015; Augurzky et al., 2018; Milkman et al., 2021; Aggarwal et al., 2023). Monetary incentives are found to be overall effective, although the effect generally decays within a couple of weeks or months from the intervention (Charness and Gneezy, 2009; Acland and Levy, 2015 (März, 2019); Royer et al., 2015). Here we contribute by showing that monetary incentives can also increase adherence to an activity that is known to primarily improve mental health.[8]

Second, on the theory side, we contribute to principal-agent problems with asymmetric information (screening). This vast literature centers on using single-crossing results to leverage private information and produce sorting which is aligned with the principal's objectives (e.g. Mirrlees, 1971; Spence, 1974). Particularly related is Maskin and Riley (1984) who show how an employer can extract maximal effort from agents with heterogeneous ability by offering a menu of increasingly challenging contracts. We contribute (i) by applying this literature to incentives for behavioral change (bringing in behavioral elements in the model); and (ii) by incorporating a new form of dynamic incentives of growing popularity in the field, the Streak incentive scheme (which brings in novel formal results). The most important difference is that we are not deriving optimal incentives, but comparing exogenous and endogenous assignments of a given (optimal or not) set of incentives. Our focus is thus more general and applied: finding optimal contracts requires information on the distribution of variables such as meditation benefits, opportunity costs,

[8]To our knowledge, we are the first to study monetary incentives in the mental health domain.

and behavioral characteristics. Our results do not rely on these observations.[9]

Third, we contribute to the growing literature on designing more effective incentives for behavioral change by changing their timing and structure.[10] Aggarwal et al. (2023) explore threshold (or *bundled*) incentives where payment is conditional on meeting a threshold over multiple (not necessarily consecutive) days. They find that threshold incentives are equally effective (but more cost-effective) at boosting daily steps than constant incentives. Supporting their theoretical prediction, threshold incentives work particularly well for impatient individuals. Our paper is the first to investigate another popular form of dynamic incentives, the Streak scheme (found in apps such as Duolingo and Snapchat). While the Streak scheme performs quite well, it achieves no better meditation rates than the Constant scheme despite paying a higher per-period reward.[11]

Fourth, we contribute to the literature on self-selection of incentives. In many of these studies, individuals decide whether to take-up an incentive scheme with which they might lose money as a commitment device to resolve their time inconsistency.[12] A few papers have studied the effects of letting people choose *between* incentive schemes. In the context of workers' performance, a handful of studies found that the choice between a fixed wage and performance-pay induces sorting between high and low types and increases average effort (Eriksson and Villeval, 2008; Cadsby et al., 2007; Dohmen and Falk, 2011; Bandiera et al., 2015; Cooper et al., 2018). Larkin and Leider (2012) find that behavioral biases (such as over- and under-confidence) may also lead to inefficient sorting, a cautionary tale against endogenous incentives.[13] Unlike these studies, we shift the focus to incentives for healthier habits, adding key elements such as intrinsic motivation and time inconsistency.

[9]We also relate to the contract theory literature with intrinsically motivated agents (cf. Murdock, 2002; Besley and Ghatak, 2005) as our agents also derive intrinsic benefits from the targeted behavior. Differently from this literature, which studies hidden action (moral hazard), we focus on hidden information.

[10]With respect to timing, incentives that are constant over time seem to be more effective than increasing and decreasing incentives (Bachireddy et al., 2019; Carrera et al., 2020).

[11]This finding may relate to results from the goal-setting literature (cf. Corgnet et al., 2015; van Lent and Souverijn, 2020): Koch and Nafziger (2020) show that *narrow* (e.g. daily) goals similar to those promoted with a Constant (piece-rate) scheme may have an edge over *broad* (e.g. weekly) goals where rewards are earned through behavior maintained over longer time periods.

[12]As many people are unwilling to put their money at risk, these studies typically find low take-up rates, which mitigate overall effects (Halpern et al., 2015; Giné et al., 2010; Royer et al., 2015; John, 2020; Adjerid et al. (2022); Woerner, 2021). A second finding in this literature is that it is quite difficult to predict who takes up a bet or commitment contract (Giné et al., 2010; Carrera et al., 2022; Lipman, 2020). Our results of partial separation show that it is also difficult to predict which subsidy schemes individuals will choose.

[13]In contrast, Kaur et al. (2015) find that sophisticated behavioral agents may choose contracts (even dominated ones) as a commitment device to overcome their biases.

More related, Adjerid et al. (2022) promote walking by letting participants choose between a constant pay rate and a higher-sized bet, and compare them with randomly assigned individuals. Their policy maker has a clear preference for the bet across the type space, and self-selection into schemes is orthogonal to his objectives (while leading to adverse selection in practice).[14] In contrast, we use mechanism design to model incentives that should lead to favorable sorting and better-than-random allocation. While we also find a negative effect of *Choice*, this is not driven by adverse selection. Thus, *Choice* might backfire even if the menu of incentives is designed to promote favorable sorting.

Our paper is closest to the parallel and independent work by Dizon-Ross and Zucker (2023) who let people choose between three step target schemes to promote walking. In contrast to Adjerid et al. (2022) and our paper, they find a positive effect of choice. A potential explanation for these opposing findings is experience with the targeted behavior. In our data, the negative effect of *Choice* is entirely driven by the 80% of participants who did not meditate at baseline. In contrast, Dizon-Ross and Zucker (2023) incentivize an (almost) universally experienced activity (walking) and also added a trial period before the choice of incentives. Another difference is the type of incentives: Dizon-Ross and Zucker (2023) compare three forms of static (target) incentives (a setup for which Maskin and Riley (1984) provides an almost perfect fit), while we compare static to dynamic incentives, extending the theory and applications to dynamic optimization settings, which may have general relevance given their frequent utilization in practice (Lepper and Nielsen, 2023).

2 Theory

We introduce a simple model to show under which conditions the policy maker can alleviate informational asymmetry problems by letting people choose between incentive schemes. Furthermore, we derive theoretical predictions that we then test in our field experiment.

2.1 Model

The target population is a continuum of N risk-neutral agents. Agents may differ along several dimensions, such as the benefits and opportunity costs of meditating and time

[14] The bet scheme is expected to increase adherence by a constant rate across the type space. In practice, the authors find evidence for unfavorable selection.

preferences. Every agent i privately knows her type. In each period $t \in \{1, 2..., \infty\}$, agents first learn about their period-specific opportunity costs of meditating c_{it}.[15] Costs are i.i.d. drawn from agent-specific uniform distributions $c_{it} \sim U[0, \overline{c}_i]$. In each t, agents decide whether to meditate or not. If the agent meditates, she immediately incurs the period's costs c_{it} and obtains delayed deterministic health benefits $b_i > 0$ in period $t + 1$. If an agent does not meditate, she incurs no costs and obtains no benefits.

Agents may be time-inconsistent and have quasi-hyperbolic preferences (Phelps and Pollak, 1968; Laibson, 1997; O'Donoghue and Rabin, 1999). The present value of discounted future utilities to agent i in period t is then given by $U_{it} = u_{it} + \beta_i \sum_{s=t+1}^{\infty} \delta_i^{s-t} u_{is}$ where $0 < \beta_i \leq 1$ and $0 < \delta_i \leq 1$ denote an agent's short and long-run discount factor respectively. Moreover, we allow agents to overestimate their short-run discount factor: We denote $\hat{\beta}_i$ as the perceived short-run discount factor, with $\beta_i \leq \hat{\beta}_i \leq 1$. For ease of exposition, we assume that $\delta_i = 1$. Because of time inconsistency, a policy maker can increase welfare by incentivizing meditation. There is an additional or alternative reason to intervene if meditating exerts positive externalities (e.g. via lowering expected health costs). We analyze such a setting in Appendix A.8.

The policy maker can choose from a finite set of incentive schemes which are ordered in terms of the challenge they present and the monetary rewards they entail. To ease the exposition, we assume that the policy maker can offer two incentive schemes:

> ***Constant incentive scheme.*** An agent obtains a constant monetary reward $m_c > 0$ for every period in which she meditates.
>
> ***P-period Streak incentive scheme.*** An agent obtains a monetary reward $m_s > 0$ every time she meditates for $P \geq 2$ consecutive periods. Once a streak is completed, the count is set back to zero.

The policy maker can decide whether to assign schemes exogenously or let agents choose in time period $t = 0$ between the two schemes.

Robustness. The subsequent results are robust to changes in our model. Relaxing some of the assumptions (such as risk neutrality and independent cost draws) alters the relative

[15] Even though our experiment lasts 36 days, our model assumes an infinite number of periods for tractability. Simulation results with 36 periods are virtually identical to our analytical results with an infinite number of periods.

performance of the Constant and Streak incentive scheme.[16] Crucially, as long as these alterations are not systematically correlated with agents' meditation benefits, they do not change the comparative statics and the effect of choice.

2.2 Analysis

We now analyze the effect of exogenously assigning agents to either incentive scheme and, subsequently, the effect of letting agents choose. We focus on average meditation frequency as the policy maker's objective. In Appendix A.5, we show that the main results also apply for a policy maker who seeks to maximize welfare.[17] Our results hold for general, not necessarily optimal, reward levels m_c and m_s.[18] We refer to Appendix A.7 for a discussion on optimal incentives. All proofs are in Appendix A.4. Throughout, we assume utility is additive and linear in the monetary component.[19]

2.2.1 Baseline, Constant and Streak incentive schemes

Baseline. In the baseline, agent i meditates in period t if and only if $\beta_i b_i \geq c_{it}$. Her expected meditation frequency at $t = 0$ is $\mathcal{F}_i^B = \frac{\beta_i b_i}{\bar{c}_i}$. The agent behaves inefficiently, given her long-run preferences, whenever her costs are lower than her benefits but higher than her discounted benefits.

Constant incentive scheme. The agent receives a constant reward m_c in period $t+1$ if she completes a meditation session in period t. Thus, agent i meditates in period t if and only if $\beta_i(b_i + m_c) \geq c_{it}$. Her expected meditation frequency thus equals $\mathcal{F}_i^C = \frac{\beta_i(b_i+m_c)}{\bar{c}_i}$.

Streak incentive scheme. The analysis of the Streak incentive scheme is based on dynamic optimization: An increased chance of meditating in the future (i.e. an increased

[16]For example, risk-averse agents meditate comparatively less under the more risky Streak scheme than risk-neutral agents. In contrast, the Streak scheme works better *ceteris paribus* when there are positive interdependencies among consecutive periods, e.g. via agents having regular schedules or forming meditation habits.

[17]The comparative statics on meditation frequencies extend to welfare measures under the additional condition that incentives are not so high as to push the agents to meditate above the optimal amount, defined by the meditation rate of an identical set of agents without time inconsistency problems.

[18]To make the setting non-trivial, we impose that neither all types meditate more under the Constant or Streak scheme nor that all types choose the same scheme. We further assume that $\max\{m_c, m_s\}+b_i < \bar{c}_i \; \forall \; i$. This condition ensures that there is no agent who always meditates in a given period under either scheme, which simplifies the analysis as it prevents kinks in agents' expected meditation frequency functions.

[19]For ease of exposition, the derivations of agents' actual and perceived utilities are in Appendix A.2.

chance of completing a streak) strengthens the reason to meditate in the present. The expected meditation frequency, denoted by $\mathcal{F}_i^S$, is derived and stated in Appendix A.1.

Comparing $\mathcal{F}_i^C$ and $\mathcal{F}_i^S$ to $\mathcal{F}_i^B$, one obtains the intuitive result that both monetary incentive schemes boost meditation frequencies.

Proposition 1 (Incentive effect) *Both the Constant and Streak incentive schemes increase an agent's expected meditation frequency compared to Baseline.*

2.2.2 Random allocation and First-Best allocation

Crucially, the Constant and Streak schemes increase meditation frequencies to a different extent depending on the agent's type. The Constant scheme is better calibrated for individuals with low meditation benefits, who find the Streak reward too demanding. Conversely, the challenging Streak scheme achieves higher meditation frequencies from agents with high benefits. In the next proposition, we formalize this intuition with a *single-crossing result.*

Proposition 2 (Single Crossing) *There is an agent-specific threshold $b_i^*(\beta_i, \hat{\beta}_i, \bar{c}_i, m_c, m_s)$ such that for $b_i < b_i^*$ the expected meditation frequency is larger under the Constant scheme, and vice-versa for $b_i > b_i^*$.*[20]

If a policy maker knew every agent's type, he could boost meditation frequencies by customizing the scheme to each agent. We define the *first-best allocation* of agents to schemes as the allocation that assigns all agents with $b_i < b_i^*$ to the Constant scheme, and all agents with $b_i > b_i^*$ to the Streak scheme. This allocation maximizes the overall expected meditation frequency by construction. Such frequency is given by $\mathcal{F}^{FB} = \frac{1}{N}(\sum_{i:b_i<b_i^*} \mathcal{F}_i^C + \sum_{j:b_j \geq b_j^*} \mathcal{F}_j^S)$.

Because agents' types are private information, any exogenous assignment of schemes cannot leverage this information, and thus we label as *random allocation.* Its expected meditation frequency is given by $\mathcal{F}^{Ra} = \frac{1}{N}\left(\sum_i \alpha \mathcal{F}_i^C + (1-\alpha)\mathcal{F}_i^S\right)$ where α (resp. $(1-\alpha)$) is the proportion of agents assigned to the Constant (resp. Streak) scheme. This includes the two extreme cases in which all agents are assigned to the Constant ($\alpha = 1$) or Streak incentive scheme ($\alpha = 0$). Obviously $\mathcal{F}^{Ra} < \mathcal{F}^{FB}$: The random allocation will assign some of the agents to the suboptimal scheme given their type.

[20] All comparative statics results are presented in Appendix A.3.

2.2.3 Choice of incentives and chosen allocation

We now explore whether an uninformed policy maker can do better than random assignment by letting the agents choose their preferred scheme in period 0. When free to choose, agents select the incentive scheme that leads to a higher *perceived* expected utility. Motivated by the monetary incentives, agents will sort at least in partial accordance with the policy maker's optimal benchmark: Those with low benefits anticipate that the Streak incentive scheme is too challenging and select out of it, while agents with high meditation benefits are attracted to the higher rewards that the Streak incentives provide for high meditation frequencies. We formalize this intuition in the next key result.

Proposition 3 (Sorting) *There is an agent-specific threshold $b_i'(\hat{\beta}_i, \bar{c}_i, m_c, m_s)$ such that all agents with $b_i < b_i'$ choose the Constant and all agents with $b_i > b_i'$ choose the Streak incentive scheme.*

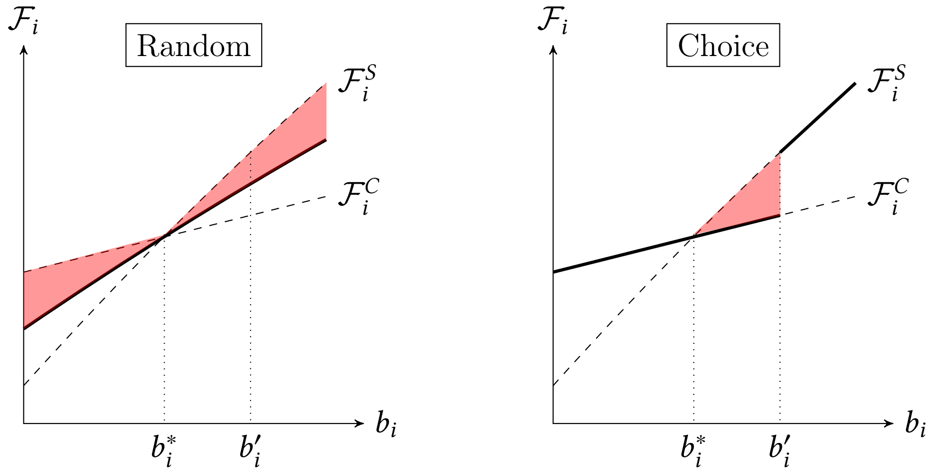
Importantly, agents sort into schemes according to their benefits, but the threshold b_i' does not fully align with the first-best threshold b_i^*: In particular, more agents choose the Constant scheme than would be optimal: $b_i^* < b_i' \ \forall \ i$ (Lemma A3). The intuition is the following: While frequency only depends on the average incentive, an agent's utility decreases in the variance in incentives. As, unlike for Constant, incentives in Streak vary in streak periods, an agent that meditates equally often under Constant and Streak strictly prefers the Constant scheme. We define the resulting allocation as *chosen allocation*. Its average expected meditation frequency is $\mathcal{F}^{Ch} = \frac{1}{N}\left(\sum_{i:b_i<b_i'} \mathcal{F}_i^C + \sum_{i:b_i\geq b_i'} \mathcal{F}_i^S\right)$.

2.2.4 Choice *versus* exogenous incentives

While the two feasible allocations (*random* and *chosen*) are both sub-optimal compared to the *first-best*, the key policy question is how they compare to each other. Figure 1 illustrates missed meditation frequencies for the two schemes compared to the first-best. The chosen allocation performs better at the extremes of the benefits distribution where agents sort in accordance to the policy maker's objectives. Vice versa, the chosen allocation performs worse for benefits in the range (b_i^*, b_i'). All these agents are misallocated from the perspective of the policy maker in the chosen allocation, while only a fraction α is misallocated in the random allocation.[21]

[21] Interestingly, the wedge between b_i^* and b_i' is smaller for naive than rational agents (see Lemmas A1 and A2) in Appendix A.3. Thus, ceteris paribus, naivety decreases the share of misallocated agents.

Figure 1: Meditation Frequencies



Note: The figure shows an agent's expected meditation frequency (in bold) depending on her meditation benefits for an example (50%-50%) random allocation (left graph) and the chosen allocation (right graph). The dashed lines depict expected meditation frequencies with the Constant respectively Streak incentive scheme. The red areas picture missed expected meditation frequencies compared to the first-best allocation.

Which allocation rule performs better depends on the distance between b_i^* and b_i' and the type distribution. If the mass of agents is not highly concentrated in the (b_i^*, b_i') interval, then the chosen allocation performs better than the random allocation (and vice versa). Importantly, there are two individually sufficient conditions under which the chosen allocation is assured to perform better than the random allocation.

Condition 1. The Constant scheme performs at least as well as the Streak incentive scheme in the *random allocation*, i.e. $\sum_i \mathcal{F}_i^C \geq \sum_i \mathcal{F}_i^S$.

Condition 2. Agents' benefits, time preferences and cost function are independent from each other, and the share of agents assigned to the Constant scheme in the *random allocation*, α, is at least as high as the share endogenously arising in the *chosen allocation*, i.e. $\alpha \geq \frac{|\{i: b_i < b_i'\}|}{N}$.

Proposition 4 (Superiority of Choice) *If Condition 1 or Condition 2 are satisfied, then letting agents choose their incentive scheme yields a higher average expected meditation frequency than exogenously assigning agents to incentive schemes.*

The intuition for Condition 1 is as follows. If the Constant scheme yields a higher average meditation frequency than the Streak scheme, then the optimal random allocation is to assign every agent to the Constant scheme. But, as every agent who chooses Streak meditates more under Streak than Constant (Lemma A3), the chosen allocation must lead to higher meditation frequencies.[22] Proposition 4 thus implies an asymmetry between using the Constant and Streak as default schemes. It is never optimal to offer agents only the Constant scheme, as this can always be improved by adding a free choice to opt for the Streak scheme. On the other hand, offering only the Streak scheme might perform better than letting agents choose between the two schemes if Streak performs better than Constant on average.

2.2.5 From theory to experiments

We test our results with a field experiment. Our main hypotheses are: (i) both the Constant and Streak incentive schemes increase average meditation frequency compared to no monetary incentives (Proposition 1); (ii) the relative performance of the two schemes depends on the expected meditation benefits of each agent (Proposition 2); (iii) subjects partially sort according to their expected meditation benefits (Proposition 3); and (iv) given that Condition 1 or 2 hold in our setting (as we show), the *chosen allocation* increases meditation frequency compared to the *random allocation* (Proposition 4).

3 Experimental Setting and Design

Our field experiment is based on a mindfulness meditation intervention. A meditation setting is a particularly suitable setting for several reasons. First, we provide estimates about the effect of choice in an important health-related and real-life application. Second, there is high heterogeneity in the benefits people derive from meditating, which makes different schemes appropriate for different individuals. And third, as pre-intervention meditation frequency is (almost) impossible to verify, it is difficult for a policy maker to accurately identify people's types. This implies that the policy maker has to rely on people's self-selection if she wants to improve on a random allocation to incentive schemes. Beyond exploring the effect of choice, a meditation intervention also allows us to study whether monetary incentives are effective not just in the physical health domain, but also work for an activity related to mental health.

Sample. The experiment was pre-registered (AEARCTR-0004881) and conducted

[22] Note that this result is very general and holds for any cost distribution function.

at the University of Amsterdam in two waves – in the end of 2019 and beginning of 2020.[23] The study was advertised as a well-being program. Participants were recruited on campus, via the mailing list of the CREED laboratory, and via social media. To be eligible, participants were required to be students and fluent in Dutch. In total, 511 participants took part in the study. We excluded 12 participants because we could not verify their student status, leading to a final sample of 499 participants. Out of these, 154 were male and 345 were female. Participants were predominantly Bachelor students and on average about 21 years old. At baseline, they meditated on average 0.43 days per week, and reported a meditation frequency goal of 3.25 days per week. 83% of participants state a meditation goal that is strictly higher than their meditation frequency at the beginning of the study, suggesting that most participants may suffer from time inconsistency or self-control issues when it comes to sustaining a meditation habit.[24]

Baseline. Table 1 presents the timeline of the experiment. Students who completed the consent form were invited to complete the baseline survey. The survey was incentivized with €10, received conditional upon completion of baseline and endline survey. The baseline survey consisted of two parts. In the first part, participants answered questions related to their mental health, meditation motivation and behavior, economic preferences and demographics, in that order. For mental health, we measured participants' mindfulness level, perceived stress, academic self-concept and self-esteem using questions of validated psychological scales.[25] We then measured participants' motivation to meditate,

[23]Subjects in both waves are overall very similar and only notably differ in gender and time preferences (cf. Table B1). The first wave of the experiment took place entirely before the Covid-19 pandemic, while the intervention period in the second wave partly fell into the beginning of the pandemic in the Netherlands (February 28, 2020: First official case; March 12, 2020: On-site lectures are suspended, and events and meetings with more than 100 people become forbidden (`https://www.universiteitenvannederland.nl/en_GB/corona-updates.html`); by March 17, 2020: 1705 confirmed cases (`https://coronadashboard.government.nl/landelijk/positief-geteste-mensen`)). Our data suggest that the pandemic significantly increased stress levels. Controlling for baseline levels, subjects in the second wave are 0.27 standard deviations ($p = 0.000$) more stressed at the endline than subjects in the first wave. However, possibly because the pandemic only took off towards the end of the intervention period of the second wave, we do not find any difference in meditation behavior, and notably also no heterogeneous treatment effects (cf. Table B3), between the two waves.

[24]An alternative explanation for the gap between current meditation frequency and goal could be experimenter demand. We argue that it is unlikely that experimenter demand is the driving factor between the gap for the following two reasons. First, given that the study was advertised as a well-being program, the selective sample of participants likely already demanded a program themselves rather than just complying with an imposed implicit demand by the policy maker. Second, it was difficult for participants to even correctly predict this implicit demand as meditation goals were elicited before participants learned about the meditation program and monetary incentives.

[25]Specifically, we used the Mindfulness Attention Awareness scale (Brown and Ryan, 2003), the Perceived Stress Scale (Cohen et al., 1983), and six questions each from the Academic Self-Concept Scale (Reynolds, 1988) and the Self-Esteem Scale (Rosenberg, 2015).

Table 1: Timeline of Experiment

Event	1st wave	2nd wave
Baseline survey	Oct 28, 2019 – Nov 1, 2019	Feb 3, 2020 – Feb 7, 2020
First meditation day	Nov 04, 2019	Feb 10, 2020
1st feedback email	Nov 13, 2019	Feb 19, 2020
2nd feedback email	Nov 20, 2019	Feb 28, 2020
3rd feedback email	Dec 01, 2019	Mar 08, 2020
Final feedback email	Dec 10, 2019	Mar 17, 2020
Endline survey	Dec 10, 2019 – Dec 14, 2019	Mar 17, 2020 – Mar 21, 2020
Meditation platform	Dec 10, 2019 – Dec 31, 2020	Mar 17, 2020 – Dec 31, 2020
Follow-up survey	Mar 19, 2020 – Mar 25, 2020	Jun 25, 2020 – Jul 1, 2020

asked them about their past meditation frequency and desired number of weekly meditation sessions for the near future. We use motivation to meditate and meditation frequency goal as a proxy measure for meditation benefits, as we cannot directly observe the latter. Our proxy *benefits* is the principal component of a subject's weekly meditation goal and her intrinsic motivation as measured by averaging responses over 6 questions extracted from the well-established Intrinsic Motivation Inventory Scale (Ryan, 1982). Both measures are taken prior to the introduction of the incentive schemes so that *benefits* is thus unaffected by the choice or allocation of the schemes. We validate the use of *benefits* as a viable proxy for actual benefits by verifying that subjects in *Control* with high *benefits* complete more meditation sessions than subjects with low *benefits* (the Spearman's rho equals $\rho = 0.215$, $p = 0.006$), as expected and predicted by our model. We also elicited participants' risk preferences, desirability of control, age, gender and study program.[26] Summary statistics are shown in Table 2.

Treatments. In the second part of the baseline survey, participants were first randomized into one of three treatments: *Control*, *Random* and *Choice*. All participants were then introduced to the 36-day online-based meditation program. They received explanations on the procedures of the meditation program and were shown a sample meditation session. Participants in *Control* received access to the meditation audio files and did not receive any monetary incentives for the completion of meditation sessions. Participants in *Random* were randomly allocated to either the Constant or Streak scheme. Participants

[26]We used the investment method by Gneezy and Potters (1997) to measure risk preferences and extracted six questions from the Desirability of Control Scale (Burger and Cooper, 1979).

Table 2: Summary Statistics

	(1) *Control*	(2) *Random*	(3) *Choice*	(4) *p*-value (1)*vs.*(2&3)	(5) *p*-value (2)*vs.*(3)
Demographics					
Age	21.12	20.99	21.37	.83	.29
Female (0/1)	.66	.72	.69	.30	.50
Bachelor student (0/1)	.82	.80	.81	.79	.83
Mental Health					
Mindfulness (1-6)	3.29	3.23	3.27	.54	.55
Perceived stress (0-40)	20.81	20.36	19.60	.15	.25
Academic self-concept (1-7)	4.44	4.39	4.50	.89	.30
Self-esteem (10-40)	27.77	27.71	28.42	.54	.20
Economic Preferences					
Investment in risky asset (0-40)	22.59	22.31	22.82	.99	.67
Short-run discount factor β	.97	.97	.97	.53	.72
Long-run discount factor δ	.95	.96	.96	.56	1.00
Desirability of Control (1-7)	4.52	4.50	4.67	.37	.04
Meditation Behavior					
Intrinsic motivation to meditate (1-7)	4.58	4.61	4.80	.27	.16
Current meditation frequency (days/wk)	.54	.42	.33	.12	.37
Meditation frequency goal (days/wk)	3.19	3.17	3.40	.69	.38
Observations	165	163	171		

Note: Column 1 depicts means of *Control*, columns 2 and 3 are the means of *Random* and *Choice*. Columns 4 (respectively 5) show the *p*-values from *t*-tests or tests of proportions with respect to the differences between *Control* and the two incentive treatments (respectively between *Random* and *Choice*). Numbers for the short-run discount factors only include 430 observations as 59 subjects did not complete the endline survey and we excluded 10 subjects that had multiple switching points in one of the two multiple price lists.

in *Choice* could choose between the two schemes.[27] To increase power, we calibrated the scheme shares in *Random* to equal the expected shares in *Choice* based on pilot data. Under the Constant scheme, participants were paid €2 for each day that they completed the 'meditation of the day' session. Under the Streak scheme, participants received €8 upon completion of a 3-day meditation streak.[28] To complete a 3-day streak, participants

[27]We considered an alternative design in which a choice was elicited from all subjects and implemented only with a certain likelihood. We decided not to pursue this route in order to more closely resemble real-world applications. We feared this alternative design could convolute results by a possible disappointment effect of one's preferred choice not being implemented.

[28]The monetary rewards of €2 and €8 respectively were set based on pilot data and the following three

had to complete meditation sessions on three consecutive days. Once a participant has completed a 3-day streak, the count is set back to zero.

Subsequently, we elicited participants' beliefs about their expected number of completed meditation sessions during the intervention period.[29] Beliefs were elicited after subjects chose or learned about their monetary incentives (and before the first meditation day). Thus, between-treatment differences in beliefs also reflect subjects' expectations about the impact of incentives on meditation frequency.

Meditation program. The 36-day meditation program lasted from November 1, 2019 until December 9, 2019 (1st wave) and from February 10, 2020 until March 16, 2020 (2nd wave). On each day of the meditation program, subjects received an email with a link to the 'meditation of the day'. Meditations were provided by the lifestyle app of a large Dutch health insurance company. All meditation sessions were guided and took between 5 and 15 minutes. We included a timer on the meditation page. Sessions for incentivized participants were only counted as completed if the participant answered the test question correctly and spent a sufficient amount of time (at least equal to the length of the meditation audio file minus 40 seconds) on the meditation page.[30] To account for the fact that participants in the control group had no incentive to answer the test question (correctly), we acted conservatively, counting as completed every started session of a non-incentivized participant, unless the timer proved that the participant had not spent a sufficient amount of time on the meditation page.[31] Thus, our estimates are, if anything, a lower bound for the true effect of incentives. Every ten days, participants received a feedback email that listed the number of completed meditations up to that day. Participants in *Random* and *Choice* additionally received information about their accumulated earnings.

Endline. We sent out the endline survey one day after the last meditation day. It included the same questions about mental health and motivation to meditate as in the

considerations. First, we chose reward levels that we expected to substantially boost meditation frequency without inducing participants to overmeditate. Second, to increase power, we chose a reward combination that had participants in *Choice* sort into approximately equally large groups. Third, we restricted the rewards to integer amounts to make payoff computations for participants as easy as possible.

[29] Subjects received €1 if they were exactly correct in their prediction.

[30] As an example of a test question, one day's question was: *What did you practice with this meditation? – a) Setting intentions, b) Breathing, c) Gratitude.*

[31] We believe this measure has enough accuracy since control group participants had no reason to pretend to start a meditation session they did not intend to complete, as they obtained no monetary benefits from doing so.

baseline survey. Additionally, we elicited participants' time preferences via multiple price lists. In the second wave, we also included additional questions (e.g. about the perceived goal of the intervention) to help understand potential explanations for the treatment effect. Finally, all participants gave feedback on their experiences during the study. On the same day, participants received access to all meditation audio files of the study and were informed about their total earnings. A couple of days later, participants were paid out. Precisely one hundred days after the endline survey, participants received a short follow-up survey that asked them about their current number of meditation days per week.

4 Experimental Results

We hereby present the results of the experiment. In section 4.1, we present the results about the effect of incentives on meditation frequency. Section 4.2 explores selection into incentive schemes, and section 4.3 analyzes the effect of choice of incentives.

4.1 The Effect of Monetary Incentives and the Single Crossing property (Propositions 1 and 2)

Monetary incentives increase meditation frequency during the intervention period both on the intensive and extensive margin, confirming Proposition 1. Subjects who are randomly assigned to the Constant (respectively Streak) incentive scheme complete on average 22.70 (respectively 22.74) meditation sessions, while subjects in the control group complete on average 11.50 sessions (see panel a in Figure 2). The differences are statistically significant (both $p = 0.000$ in the two-sided t-test).[32] On the extensive margin, 97% of subjects who are assigned to Constant and Streak complete at least one meditation session compared to 85% of non-incentivized subjects ($p = 0.007$ respectively $p = 0.003$ in the two-sided test of proportions; see panel b in Figure 2).[33] The effect of incentives does not differ significantly between female and male participants (cf. Table B4).

Average meditation frequencies fall considerably short of subjects' incentivized beliefs of 29.83 (Constant), 28.19 (Streak) and 24.44 (*Control*), all $p = 0.000$ in two-sided paired

[32]Table B2 shows that the results are robust to alternative non-parametric specifications.

[33]Even though the intervention period of the second wave fell into the beginning of the Covid-19 pandemic, the treatment effects of the first and second wave are very similar (cf. Table B3).

t-tests.[34] This discrepancy is suggestive for the presence of time inconsistency issues in our studied sample. Relatedly, belief data provide suggestive evidence that incentives were calibrated appropriately and did not induce excessive meditation rates: One can interpret subjects' incentivized beliefs in *Control* as a lower bound for the optimal frequency (as this measure ignores sophistication about time inconsistency and possible positive externalities of meditation). Because these beliefs are higher on average than attained meditation frequencies in both Constant and Streak, we conclude that providing incentives narrowed the gap between optimal and actual meditation rates without overshooting (cf. Figure B2 and Appendix A.5). As such, our data suggest that the incentives were effective at improving both adherence and welfare.[35] The increase in average meditation frequency comes at a cost of €45.40 (Constant) respectively €51.18 (Streak) per incentivized participant; a difference that is statistically not significant ($p = 0.1908$ in the two-sided t-test). The costs per extra completed session under Constant and Streak are therefore €4.05 respectively €4.55.

While the two incentive schemes increase meditation frequencies to almost the same extent on average, they differ in whose frequencies are most affected. In line with the single-crossing property (Proposition 2), subjects with high benefits of meditation complete more sessions when randomly assigned to the Streak and subjects with low benefits complete more sessions when randomly assigned to the Constant incentive scheme (see Figure B3). Regressing completed meditation sessions on Streak (vs. Constant) assignment and meditation benefits as well as their interaction term shows that the net effect of Streak is increasing significantly in benefits ($p = 0.043$ of the interaction term; see Table B5).

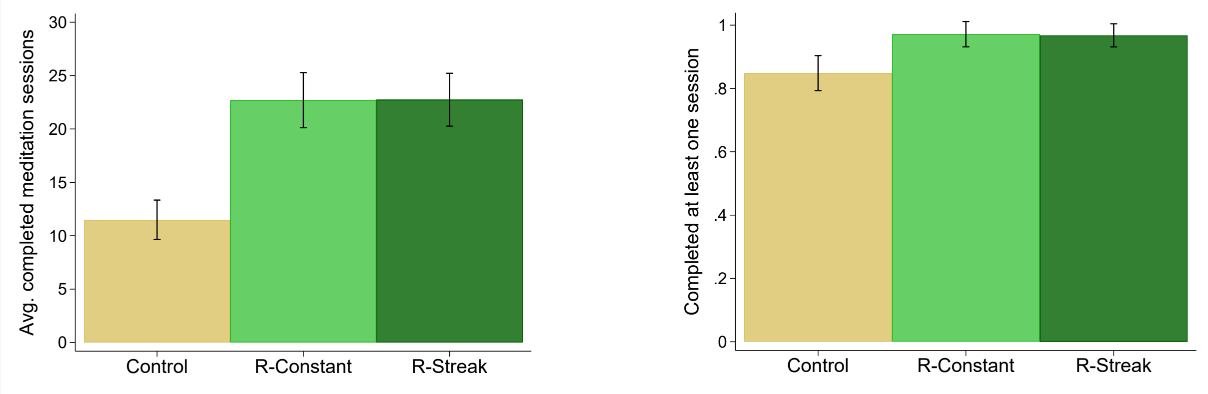
4.2 Sorting (Proposition 3)

Out of the 171 subjects assigned to Choice, 96 (56.14%) chose Streak and 75 (43.86%) chose Constant. Do subjects sort intentionally and based on their expected benefits from

[34] Interestingly, subjects in *Control* state significantly higher beliefs than their weekly meditation frequency goal (adjusted for the 36-day intervention) of 16.43 ($p = 0.000$ in the paired two-sided t-test). This difference is entirely driven by subjects who did not meditate at baseline. We explain these findings by the fact that subjects expressed their meditation goals before and their beliefs after having been introduced to the intervention, which features beginner-friendly and (possibly surprisingly) short meditation clips of about 10 minutes.

[35] There is also some only suggestive indication that incentives might have improved participants' mental health as they led to a – not significant ($p = 0.277$) – increase of 0.07 standard deviations in our combined measure of mental health (cf. Appendix B.1).

Figure 2: Effect of Incentives



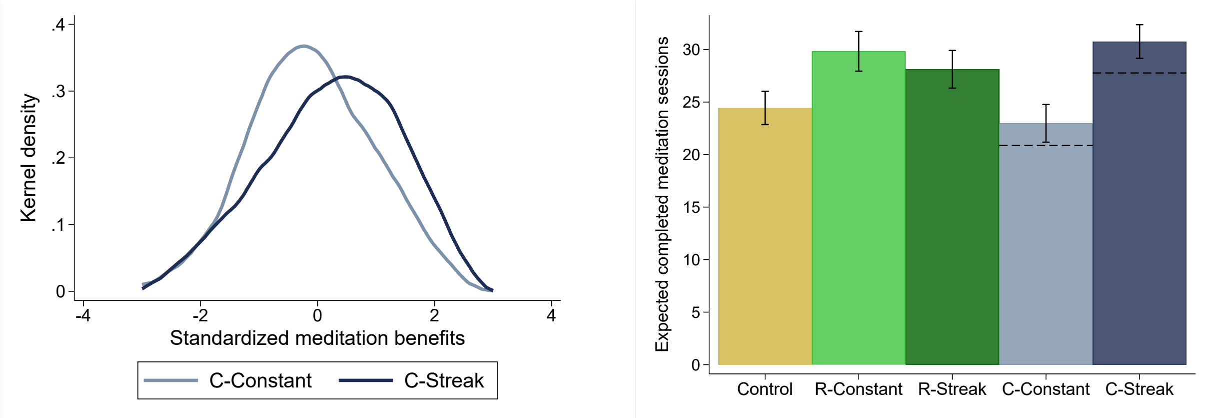
(a) Intensive Margin (b) Extensive Margin

Note: The left panel shows average meditation frequencies during the intervention period for non-incentivized subjects (sand), and subjects that are randomly assigned to the Constant (light green) and Streak (dark green) incentive schemes. The right panel shows the share of subjects that completed at least one meditation session during the intervention period. The black bars indicate 95% confidence intervals.

meditation in line with the sorting hypothesis? In our model, this is the necessary channel through which *Choice* leads to a higher meditation frequency than *Random*. The answer is yes. Subjects who choose Streak have significantly higher (by about one third of a standard deviation) average meditation benefits than subjects who choose Constant (0.25 vs. -0.10, p = 0.028 in the two-sided t-test).[36] The density distribution of meditation benefits among subjects who chose Streak is of similar shape as the distribution among subjects who chose Constant but is shifted to the right as depicted in panel a of Figure 3. The two distributions are significantly different (p = 0.024 in the Kolmogorov-Smirnov test). The sorting of participants is also reflected in participants' beliefs about their own meditation frequencies. As shown in panel b of Figure 3, average beliefs do not significantly differ between schemes in *Random* (p = 0.199 in the two-sided t-test, and p = 0.504 in the Kolmogorov-Smirnov test), but subjects who choose Streak expect to complete significantly more meditation sessions than subjects who choose Constant (30.76 vs. 22.97; the difference is significant with p = 0.000 in both the two-sided t-test and the Kolmogorov-Smirnov test). We also find evidence of sorting by comparing the actual meditation frequencies, analyzed in the next section, with participants who choose Streak meditating 9.86 more days on average than participants who choose Constant (p = 0.000).

[36]This result is robust to using only intrinsic motivation (0.31 vs. 0.01, p = 0.048 in the two-sided t-test) or meditation goal (3.74 vs. 2.96, p = 0.040 in the two-sided t-test) as a proxy for meditation benefits.

Figure 3: Sorting



(a) Meditation Benefits (b) Beliefs

Note: The left panel depicts the kernel density distributions of standardized meditation benefits (with Epanechnikov kernel function and a half-width of 0.5), split by chosen incentive scheme. The right panel depicts average beliefs about completed meditation sessions during the intervention period, split by treatment and incentive scheme. The black bars indicate 95% confidence intervals. The dashed lines indicate average beliefs about completed meditation sessions under the counterfactual assumption that a participant had chosen the respectively other scheme.

Thus, a majority of participants choose intentionally and in line with the policy maker's objectives.

The lack of full separation between the two distributions in Figure 3 might be caused by heterogeneous costs or time preferences, as predicted in our model.[37] In addition, it could be driven by unmodeled properties such as risk preferences,[38] stochastic decision errors or some subjects not fully understanding the relationship between their choice of incentive scheme, meditation benefits and expected meditation rates.[39]

Interestingly, we also find evidence for the partial misalignment between the agents' choice of threshold (indicated as b_i' in the theory), and the first-best allocation threshold (b_i^*). In other words, we see a fraction of subjects who chose the Constant scheme, but were expected to achieve a higher meditation frequency under the Streak scheme: Figure B2 depicts that in *Random* the Streak scheme achieves higher meditation frequencies than the Constant scheme for subjects above the 35th percentile in meditation benefits.

[37] Albeit in the predicted direction, choosing Streak is not significantly linked to time discounting (in money) (Spearman's rho of short-run discount factor and choosing Streak equals $\rho = 0.040$, $p = 0.630$).

[38] In Figure B4 we show that the Streak scheme leads to larger volatility in payoffs. However, risk preferences do not seem to be linked to the choice of the scheme (Spearman's rho of risk aversion and choosing Streak equals $\rho = 0.035$, $p = 0.647$).

[39] Note, however, that there was a comprehension check in the baseline survey to ensure that all subjects understand the rules of the incentive schemes.

However, 44% of subjects select the Constant scheme when given the choice.[40]

4.3 The Effect of *Choice* (Proposition 4)

We now turn to the question of whether *Choice* leads to higher average meditation frequency than *Random*. Proposition 4 predicts this result if at least one of the two individually sufficient conditions for expecting a positive effect of *Choice* is satisfied in our experimental data. Condition 1 is satisfied as the Constant and Streak incentive scheme in *Random* yield practically the same average meditation frequency (22.70 vs. 22.74).[41] The theory thus predicts an unambiguous superiority of *Choice* in boosting meditation frequencies.

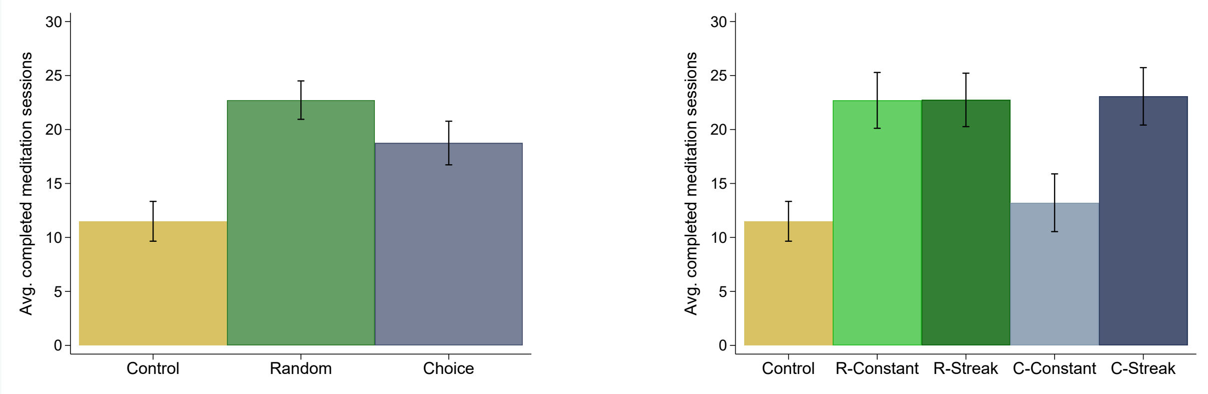
Experimental results are presented in panel *a* of Figure 4. Contrary to our predictions, letting subjects choose their incentive scheme leads to a lower (rather than a higher) average meditation frequency (18.75 for *Choice* vs. 22.72 for *Random*). The difference between the two incentivized treatments is statistically significant ($p = 0.004$ in the two-sided t-test).[42] Splitting the incentivized treatments by incentive scheme, panel *b* of Figure 4 shows that the difference between *Random* and *Choice* is entirely driven by the differential performance of subjects in the Constant incentive scheme. Subjects who chose the Constant incentive scheme completed 13.13 sessions, a number statistically non-different from the completion rate in *Control* ($p = 0.301$ in the two-sided t-test). On the other hand, subjects who chose or were assigned to the Streak incentive scheme, as well as subjects randomly assigned to the Constant incentive scheme meditated an approximately equal and not statistically distinguishable number of sessions (22.85 on average across the three groups).

[40] An alternative approach to obtain a measure of the gap between b_i' and b_i^* is via a regression of completed meditation sessions on Streak (vs. Constant) assignment and meditation benefits as well as their interaction term. This yields an estimate of the value of meditation benefits that equates expected meditation frequency under Constant and Streak. Doing so, we find that the fraction of subjects in *Choice* who are predicted to meditate more under the Streak scheme is 54% (for a linear specification) respectively 60% (for a quadratic specification). The estimated size of the gap with this method is thus conditional on the specification but still points to the presence of a (weakly) positive gap, as predicted.

[41] The data also suggest that Condition 2 is satisfied because a) the quota of subjects in each incentive scheme is almost identical across the two incentivized treatments: 57.06% (respectively 56.14%) of subjects are paid the Streak incentive in *Random* (respectively *Choice*), and b) individuals' meditation benefits and time preferences seem to be independently distributed (Spearman's rho between our proxies for meditation benefits and short-run discount factor equals $\rho = 0.018$, $p = 0.714$).

[42] The treatment effect is not modulated by how much subjects desire to maintain a sense of control, according to the desirability of control index as shown in Table B6. We also do not find different effects of *Choice* by gender ($p = 0.925$; Table B4).

Figure 4: Meditation Frequencies



(a) By treatment

(b) By treatment and scheme

Note: The figure depicts average number of completed meditation sessions during the intervention period split by treatment (left panel) and treatment and incentive scheme (right panel). The black bars denote 95% confidence intervals.

The surprising treatment effect crucially hinges on subject's meditation frequency prior to the study. We only find a negative effect of *Choice* compared to *Random* for subjects who did not meditate at baseline (p = 0.000 in the two-sided t-test, N = 268); there is no effect for the about 20% of subjects who meditated at baseline at least once a week (p = 0.344 in the two-sided t-test, N = 66).[43] Indeed, a regression of completed meditation sessions on dummy variables identifying *Choice* and a strictly positive meditation frequency at baseline as well as their interaction term shows that letting people choose works significantly better for subjects who meditate at baseline (p = 0.012 of the interaction term) as depicted in Table B6.

5 Understanding the Negative Effect of *Choice*

The comparatively poor performance of *Choice* runs contrary to our theoretical predictions. In this section, we dive into possible explanations for this unexpected finding. We start with a set of coherent results to show that bad selection (i.e. subjects sorting incorrectly into schemes) is unlikely to explain the result. Instead, we infer that the negative effect of *Choice* is likely *psychological* (presumably activated by the act of choosing), and

[43]Note that the non-significant effect for subjects who meditated at baseline might be due to the small sample. However, given that for this group we estimate a *positive* point estimate for the effect of *Choice* compared to *Random* on meditation frequency (2.89 sessions), letting experienced people choose has likely no negative effect on adherence.

propose a suggestive list of channels through which such effect can operate.

5.1 Ruling out Selection Effects

Based on three pieces of evidence, we infer that the poor performance of *Choice* is likely not due to bad selection. First, as extensively discussed in section 4.2, subjects who choose Streak have on average higher meditation benefits than subjects who choose Constant. The sorting according to meditation benefits is not only theoretically predicted to increase the performance of *Choice*, it is also empirically supported by data from the *Random* treatment where we see that participants with high (respectively low) meditation benefits indeed meditate more under the Streak (respectively Constant) scheme (Figure B3).

Second, elicited beliefs about expected meditation frequencies are significantly higher than counterfactual beliefs, i.e. beliefs regarding the meditation frequency that would occur had the subject been assigned to the scheme that they did *not* choose.[44] Counterfactual beliefs are estimated right after actual beliefs and could not be incentivized by construction. Taken at face value, they suggest that subjects believe that their chosen scheme enables them to meditate more often than their not-chosen scheme.

Lastly, the negative effect of *Choice* plotted against quantiles of meditation frequency is most pronounced for medium meditation frequencies (as shown in Figure B5). This is at odds with the hypothesis of anti-selection (i.e. sorting that runs opposite to theoretical predictions), as we should then observe a comparatively more negative effect of *Choice* at the extremes of the distribution, where the mismatch between incentive schemes and types is largest.

5.2 Psychological Effects

Having ruled out adverse selection effects as a likely explanation, we infer that the poor performance of *Choice* is likely due to psychological factors, presumably instilled by the act of choosing itself. In what follows, we provide a list of suggestive explanations. The potential channels discussed in this section are not part of the pre-registered analysis; they should be seen as exploratory in nature and serving as a conceptual map for future research. Due to the psychological richness of the setup, we also do not view this list as

[44] The average beliefs in *Choice* are 27.34 completed meditation sessions; while average counterfactual beliefs in *Choice* are 24.74 completed sessions ($p = 0.000$ in the two-sided t-test).

exhaustive.

Negative self-signaling. One possible explanation is the potential demotivating effect associated with choosing the *less challenging* Constant scheme: Since the Constant scheme pays less than the Streak scheme for high meditation rates, a subject that chooses Constant may, by this very act, reveal to herself (and to the policy maker) that she is targeting a low completion rate (Prelec and Bodner, 2003; Bénabou and Tirole, 2004; Grossman, 2015). This (self-) signaling or expectation can in turn become self-fulfilling and lead to lower meditation frequency in *Choice* compared to *Random*.[45] Our data can be cautiously interpreted in favor of this hypothesis. The detrimental effect of self-signaling should be particularly pronounced for inexperienced subjects as they are the ones who have not yet formed a stable self-image about their propensity to meditate. We find suggestive evidence for this prediction in our data as the negative effect of choice is entirely driven by subjects who did not meditate at baseline. Further, self-signaling is presumed to immediately decrease beliefs about meditation frequency of subjects who chose the Constant scheme. Indeed, there is a large gap between the beliefs of subjects choosing Constant and those randomly assigned to it (cf. panel *b* in Figure 3). To control for selection effects, we compare beliefs in *Random*-Constant with a combination of beliefs in *Choice*, namely *actual* beliefs of subjects who chose Constant and *counterfactual* beliefs of subjects who chose Streak.[46] We find that beliefs in *Random*-Constant are significantly higher than the combined beliefs in *Choice* (29.83 vs. 25.67; $p = 0.001$).

Regret aversion. Throughout the intervention, subjects in *Choice* may recall their counterfactual earnings, i.e. their payoffs had they chosen the other scheme. This in turn may make them reluctant to engage in a meditation pattern that would have earned them more money under the scheme they have not chosen. In particular, subjects in *Choice*-Constant may refrain from meditating three times in a row to avoid the regret of having lost the extra payment of €2 that they would have earned under Streak. We explore this hypothesis by studying meditation patterns on days that would mark a complete streak, dubbed 'Decisive Days'. Table B7 shows that, irrespective of the specification, subjects

[45] From a conceptual viewpoint, a self-signaling channel could also be entertained for subjects selecting into the Streak scheme, who would derive a boost in motivation to meditate. Arguably, however, offering monetary incentives implicitly expects participants to meditate often. Because of this, the Streak might act as the default scheme, so that choosing Constant becomes a much stronger signal than choosing Streak.

[46] We elicited non-incentivized counterfactual beliefs in *Choice* by asking about subjects' expectation regarding how often they would have meditated with the incentive scheme that they had *not* chosen.

who chose the Constant incentive scheme are not less (or more) likely to meditate on a day that would complete a streak than subjects who were randomly assigned to Constant. In other words, we do not observe unusually low completion rates on the third day of a streak by subjects who have chosen the Constant scheme. We thus do not find evidence in favor of the regret aversion hypothesis.

Change in beliefs about features and scope of the intervention. Although instructions were kept as similar as possible, the necessary changes induced by the two treatments may have pushed subjects to form different beliefs about the intervention along several dimensions, e.g. regarding the policy maker's main intention with the intervention and her sophistication about the efficacy of incentives. In *Random*, subjects only got to see the incentive scheme they were assigned to. In *Choice*, subjects got to see both schemes. Comparing incentive schemes could alter subjects' perception about the size of the incentives. We explore these hypotheses with a non-incentivized questionnaire added to the end of the second-wave endline survey.[47] None of the questions shows any notable difference between *Random* and *Choice* (see Table B8). Thus the poor performance of *Choice* does not seem driven by differences in the presentation of incentive schemes, at least along the dimensions explored in the questionnaire.

6 Conclusion

In this paper, we theoretically and empirically investigate the effects of letting people choose between two incentive schemes; a Constant scheme that remunerates subjects for each completed meditation session and a Streak scheme that pays subjects a larger amount but only if they complete three sessions in a row. We derive testable conditions under which letting participants choose is predicted to increase the overall adherence to the policy intervention, and test this prediction in a field experiment designed to increase adherence to a daily mindfulness meditation program.

We find that the two incentive schemes significantly increase meditation frequency by similar amounts compared to the non-incentivized group during the intervention period.[48]

[47]In total, we ask four perception questions: Two about the experimenter's intention (maximizing meditation frequency and optimizing meditation frequency for participants), one about his expertise in providing monetary incentives, and one about participants' perceived size of the rewards. Differences in answers between *Random* and *Choice* in the first three questions could point toward an experimenter demand effect, while a difference in the fourth question would identify a difference in perceived incentives.

[48]We do not find any long-term effects (cf. Appendix B.2), which is in line with the great majority of

We further find that letting subjects choose their incentives leads to self-selection into the two schemes in accordance with the theoretical prediction. However, in contrast to our prediction, letting subjects choose their incentives lead to lower meditation frequency than distributing the incentives randomly. The negative effect of choice is entirely driven by subjects who did not meditate at baseline. Our data allow us to rule out poor self-selection into incentive schemes as a likely explanation for the negative effect of *Choice*. While our data speculatively suggest a negative self-signaling effect by subjects choosing the less challenging Constant scheme, we do not find support for alternative explanations such as regret aversion, differences in presentation and dislike of choice.

All in all, our paper shows that monetary incentives are a viable tool to change individuals' behavior, at least in the short run, not only in the physical but also in the mental health domain. The innovative Streak scheme proves a good alternative to the more standard Constant scheme; however, it also does not outperform the latter on average. While our theoretical model shows that, under mild assumptions, choice should work better than a random allocation, our experimental results act as a cautionary tale against letting, in particular inexperienced, individuals choose between incentive schemes. Policy makers may consider implementing a short try-out-period in which individuals are able to gain experience with the targeted activity before the actual choice is made, as successfully implemented with commitment contracts (Royer et al., 2015; Sadoff and Samek, 2019). In addition, future research should investigate how the process of individuals choosing their incentives can be improved via guidance by the policy maker or tailored recommendations.

papers in the literature (e.g. Acland and Levy, 2015 (März, 2019); Carrera et al., 2018; Woerner, 2021).

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Online Appendix

A Theoretical Appendix

A.1 Solving the model under Streak incentives

Under Streak incentives, an agent's behavior in all periods except the last streak-period, i.e. the Pth streak-period of a P-period streak, depends on her beliefs about her future behavior. In contrast, an agent's behavior in last streak-periods does not depend on beliefs. This is because the period following a last streak-period is always a first streak-period irrespective of whether the agent meditates or not. We thus start solving the problem for last streak-periods. Here, an agent faces the same decision problem as with the Constant incentive scheme, except that the extra reward for meditating in this period equals m_s instead of m_c. Agent i's expected meditation frequency in last streak-periods thus equals $\mathcal{F}^S_{i,P} = \frac{\beta_i(b_i+m_s)}{\bar{c}_i}$.

All other streak-periods do not directly generate a monetary reward for meditating. Meditating in such periods merely preserves the chance to complete a streak and thereby receive m_s. If the agent does not meditate, she foregoes this chance and enters a new streak. Denote the value that agent i assigns in streak period $p < P$ to keeping the chance to complete the streak by her perceived option value $\hat{v}_{i,p}$. This option value equals the difference between her perceived expected utility in the next streak-period, $\hat{\mathcal{U}}^S_{i,p+1}$, and her perceived expected utility from starting a new streak, $\hat{\mathcal{U}}^S_{i,1}$ (cf. (A6)). As the benefits and perceived option value are future payoffs but costs are immediate, agent i meditates in period t if and only if $\beta(b_i + \hat{v}_{i,p}) \geq c_{it}$. Therefore, her expected meditation frequency in all but the last streak period is $\mathcal{F}^S_{i,p} = \frac{\beta_i(b_i+\hat{v}_{i,p})}{\bar{c}_i}$. Note that $\hat{v}_{i,p}$ is increasing in p, i.e. the perceived option value increases the closer an agent gets to the last streak-period (cf. Proof of Proposition 2). This implies that agents are more likely to meditate in later compared to earlier streak-periods. This is in contrast to the Constant incentive scheme, under which agents meditate equally frequently, irrespective of their prior realized meditation decisions.

Agent i's overall expected meditation frequency depends on the likelihood of her being in each streak period, $q_{i,p}$. Agents only enter a streak-period p in period t if they were both in a streak-period $p-1$ in $t-1$ and also meditated in $t-1$. The likelihood of an agent being in a streak-period p thus equals the likelihood of the agent being in a streak-period $p-1$ times her expected meditation frequency in streak-periods $p-1$. Formally, this implies that $q_{i,p} = q_{i,p-1}\mathcal{F}^S_{i,p}$ must hold. As $\sum_p q_{i,p} = 1$, this equates to $q_{i,p} = \frac{\frac{1}{\mathcal{F}^S_{i,p}}\prod_{k=1}^{p}\mathcal{F}^S_{i,k}}{1+\sum_{m=1}^{P}\prod_{k=1}^{m-1}\mathcal{F}^S_{i,k}}$. The resulting expected meditation frequency then equals

$$\mathcal{F}^S_i = \sum_{p=1}^{P} q_{i,p}\mathcal{F}^S_{i,p} = \frac{\sum_{p=1}^{P}\prod_{k=1}^{p}\mathcal{F}^S_{i,k}}{1+\sum_{m=1}^{P}\prod_{k=1}^{m-1}\mathcal{F}^S_{i,k}} = \frac{\sum_{p=1}^{P}\prod_{k=1}^{p}\frac{\beta_i(b_i+\hat{v}_{i,k})}{\bar{c}_i}}{1+\sum_{m=1}^{P}\prod_{k=1}^{m-1}\frac{\beta_i(b_i+\hat{v}_{i,k})}{\bar{c}_i}}. \tag{A1}$$

where $\hat{v}_{i,P} = m_s$. Note that an agent's expected meditation frequency increases in her perceived short-run discount factor $\hat{\beta}_i$. An overoptimistic belief about one's future meditation behavior makes one overestimate the option values, thereby driving up *actual* meditation frequency.

A.2 Utility

This section derives the effect of incentives on agents' actual and perceived utility. As agents may be time-inconsistent, we need to take a stance on whether an agent's long-run or short-run preferences describe her 'true' preferences. As is standard in the literature, we assume that agents' long-run (time-consistent) preferences are utility- and welfare-relevant (O'Donoghue and Rabin, 2001; DellaVigna and Malmendier, 2004; Galperti, 2015). Note that this assumption does not affect the results in the main text. Next to agents' actual expected utilities, we also derive agents' perceived expected utilities under Constant and Streak, which determine how agents choose between the two incentive schemes.

Baseline: If agent i meditates in period t, she obtains a utility of $b_i - c_{it}$. If she does not meditate, her utility is zero. As agent i meditates in period t if and only if $\beta_i b_i \geq c_{it}$, her expected per-period utility thus equals

$$\mathcal{U}^B_i = \int_0^{\beta_i b_i}(b_i - c_{it})\frac{1}{\bar{c}_i}dc_{it} = \frac{1}{2\bar{c}_i}(2-\beta_i)\beta_i b_i^2. \tag{A2}$$

Constant: If agent i meditates in period t, she obtains a utility of $b_i + m_c - c_{it}$. If she does not meditate, her utility is zero. As agent i meditates in period t if and only if

$\beta_i(b_i + m_c) \geq c_{it}$, her expected per-period utility thus equals

$$\mathcal{U}_i^C = \int_0^{\beta_i(b_i+m_c)} (b_i + m_c - c_{it}) \frac{1}{\overline{c}_i} dc_{it} = \frac{1}{2\overline{c}_i}(2 - \beta_i)\beta_i(b_i + m_c)^2. \tag{A3}$$

(Partially) naive agents ($\beta_i < \hat{\beta}_i \leq 1$) mispredict their meditation frequency and expect to meditate in any period t whenever $\hat{\beta}_i(b_i + m_c) \geq c_{it}$, resulting in a perceived expected per-period utility at $t = 0$ of

$$\hat{\mathcal{U}}_i^C = \beta_i \int_0^{\hat{\beta}_i(b_i+m_c)} (b_i + m_c - c_{it}) \frac{1}{\overline{c}_i} dc_{it} = \frac{\beta_i}{2\overline{c}_i}(2 - \hat{\beta}_i)\hat{\beta}_i(b_i + m_c)^2. \tag{A4}$$

Streak: Similar to under the Constant incentive scheme, an agent's actual and perceived total per-period utilities in streak-period p under the Streak incentive scheme equal

$$\mathcal{U}_{i,p}^S = \int_0^{\beta_i(b_i+\hat{v}_{i,p})} (b_i + \hat{v}_{i,p} - c_{it}) \frac{1}{\overline{c}_i} dc_{it} = \frac{1}{2\overline{c}_i}(2 - \beta_i)\beta_i(b_i + \hat{v}_{i,p})^2 \tag{A5}$$

respectively

$$\hat{\mathcal{U}}_{i,p}^S = \int_0^{\hat{\beta}_i(b_i+\hat{v}_{i,p})} (b_i + \hat{v}_{i,p} - c_{it}) \frac{1}{\overline{c}_i} dc_{it} = \frac{1}{2\overline{c}_i}(2 - \hat{\beta}_i)\hat{\beta}_i(b_i + \hat{v}_{i,p})^2. \tag{A6}$$

However, an agent's overall actual and perceived expected per-period utilities $\mathcal{U}_i^S$ respectively $\hat{\mathcal{U}}_i^S$ are a discounted and weighted average of her expected per-period *direct* utilities. Note that the direct per-period utilities in all but the last streak-period equal the total per-period utilities minus the perceived option value times the per-period frequencies, thus $\int_0^{\beta_i(b_i+\hat{v}_{i,p})} (b_i - c_{it}) \frac{1}{\overline{c}_i} dc_{it} = \mathcal{U}_{i,p}^S - \hat{v}_{i,p}\mathcal{F}_{i,p}^S$ respectively $\int_0^{\hat{\beta}_i(b_i+\hat{v}_{i,p})} (b_i - c_{it}) \frac{1}{\overline{c}_i} dc_{it} = \hat{\mathcal{U}}_{i,p}^S - \hat{v}_{i,p}\hat{\mathcal{F}}_{i,p}^S$. Summing and discounting over all per-period direct utilities, we obtain

$$\hat{\mathcal{U}}_i^S = \beta_i \sum_p^{P-1} \hat{q}_{i,p}(\hat{\mathcal{U}}_{i,p}^S - \hat{v}_{i,p}\hat{\mathcal{F}}_{i,p}^S) + \hat{q}_{i,P}\hat{\mathcal{U}}_{i,P}^S = \beta_i \sum_p^{P-1} \hat{q}_{i,p}(\hat{\mathcal{U}}_{i,p}^S - (\hat{\mathcal{U}}_{i,p+1}^S - \hat{\mathcal{U}}_{i,1}^S)\hat{\mathcal{F}}_{i,p}^S) + \hat{q}_{i,P}\hat{\mathcal{U}}_{i,P}^S = \beta_i\hat{\mathcal{U}}_{i,1}^S$$

as $\hat{q}_{i,p+1} = \hat{q}_{i,p}\hat{\mathcal{F}}_{i,p}^S$ and $\hat{v}_{i,p} = \hat{\mathcal{U}}_{i,p+1}^S - \hat{\mathcal{U}}_{i,1}^S$. Therefore, an agent's perceived expected per-period utility at $t = 0$ equals

$$\hat{\mathcal{U}}_i^S = \frac{\beta_i}{2\overline{c}_i}(2 - \hat{\beta}_i)\hat{\beta}_i(b_i + \hat{v}_{i,1})^2. \tag{A7}$$

Similarly, we obtain

$$\mathcal{U}_i^S = \sum_p^{P-1} q_{i,p}(\mathcal{U}_{i,p}^S - \hat{v}_{i,p}\mathcal{F}_{i,p}^S) + q_{i,P}\mathcal{U}_{i,P}^S = \sum_p^{P-1} q_{i,p}(\mathcal{U}_{i,p}^S - (\hat{\mathcal{U}}_{i,p+1}^S - \hat{\mathcal{U}}_{i,1}^S)\mathcal{F}_{i,p}^S) + q_{i,P}\mathcal{U}_{i,P}^S$$

$$\mathcal{U}_i^S = \hat{\mathcal{U}}_{i,1}^S - \sum_p^{P} q_{i,p}(\hat{\mathcal{U}}_{i,p}^S - \mathcal{U}_{i,p}^S)$$

As $\mathcal{U}_{i,p}^S = \frac{(2-\beta_i)\beta_i}{(2-\hat{\beta}_i)\hat{\beta}_i}\hat{\mathcal{U}}_{i,p}^S$, an agent's actual expected per-period utility thus equals

$$\mathcal{U}_i^S = \hat{\mathcal{U}}_{i,1}^S - \left(1 - \frac{(2-\beta_i)\beta_i}{(2-\hat{\beta}_i)\hat{\beta}_i}\right) \sum_p^{P} q_{i,p}\hat{\mathcal{U}}_{i,p}^S \tag{A8}$$

Having characterized the actual expected utilities in the baseline (A2) as well as Constant (A3) and Streak scheme (A8), we can derive the following result.

Proposition A1 (Incentive effect on Utility) *Both the Constant and Streak incentive scheme increase an agent's expected utility.*

Note that this result holds irrespective of the size of incentives, even if the incentives induce an agent to overmeditate. The intuition is that the monetary rewards always overcompensate a possible overmeditation, at least in expectation. Ex-post, it could occur that the Streak scheme decreases an agent's utility if the agent fails to complete a streak.

A.3 Comparative Statics

Lemma A1 (Comparative Statics of b_i^*) *Threshold $b_i^*(\beta_i, \hat{\beta}_i, \overline{c}_i, m_c, m_s)$ increases in $\overline{c}$ and m_c and decreases in β_i, $\hat{\beta}_i$ and m_s.*

The above Lemma implies that time inconsistency has a stronger negative effect on meditation frequency under the Streak compared to the Constant incentive scheme. This is partly negated by naivety as naive agents overestimate their future meditation behavior, which positively affects actual behavior via a higher perceived option value $\hat{v}_{i,p}$ $\forall$ $p < P$.

Lemma A2 (Comparative Statics of b_i') *Threshold $b_i'(\hat{\beta}_i, \overline{c}_i, m_c, m_s)$ increases in $\overline{c}$ and m_c and decreases in $\hat{\beta}_i$ and m_s.*

The threshold b'_i does not depend on β_i as an agent's choice depends on her perceived but not her actual short-run discount factor. This implies that naive agents ($\beta_i < \hat{\beta} = 1$), ceteris paribus, choose the same as rational agents ($\beta_i = \hat{\beta} = 1$). In contrast, (partial) sophistication ($\beta_i \leq \hat{\beta} < 1$) makes the more challenging Streak incentive scheme comparatively less appealing as $\frac{\partial b'_i}{\partial \hat{\beta}_i} < 0$, and thus pushes agents towards choosing the Constant rather than the Streak incentive scheme.

Lemma A3 (Comparing b^*_i and b'_i) *For all agents, it holds that* $b^*_i(\beta_i, \hat{\beta}_i, \bar{c}_i, m_c, m_s) < b'_i(\hat{\beta}_i, \bar{c}_i, m_c, m_s)$.

The lemma implies that all indifferent agents meditate more under Streak than Constant. As a result of this wedge, the meditation frequency achieved by choice is also below the first-best allocation. Further, it implies an asymmetry between Constant and Streak; while every agent who chooses Streak meditates more under Streak than Constant, not every agent who chooses Constant necessarily meditates more under Constant than Streak.

A.4 Proofs

Proof of Proposition 1 (Incentive effect) ← Constant: $\mathcal{F}^C_i = \frac{\beta_i(b_i+m_c)}{\bar{c}_i} > \frac{\beta_i b_i}{\bar{c}_i} = \mathbb{E}[\mathcal{F}^B_i]$ as $m_c > 0$ and $b_i \geq 0$ by assumption. Streak: Meditation frequency under Streak equals $\mathcal{F}^S_i = \sum_{p=1}^{P} q_{i,p} \frac{\beta_i(b_i+\hat{v}_{i,p})}{\bar{c}_i}$. Clearly, a sufficient condition for $\mathcal{F}^S_i > \mathcal{F}^B_i$ is $\hat{v}_{i,p} > 0 \ \forall \ i,p$. The proof is by contradiction. First, recall the perceived option value $\hat{v}_{i,p} = \hat{\mathcal{U}}^S_{i,p+1} - \hat{\mathcal{U}}^S_{i,1}$ and perceived total per-period utility $\hat{\mathcal{U}}^S_{i,p} = \frac{1}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i(b_i+\hat{v}_{i,p})^2 \ \forall \ i,p$ (A6). Now, assume that for an arbitrary i there exists at least one $\hat{v}_{i,p} \leq 0$. Define by k the lowest p for which this is the case. If $k=1$, $\hat{v}_{i,1} = \hat{\mathcal{U}}^S_{i,2} - \hat{\mathcal{U}}^S_{i,1} \leq 0$. It follows that $\hat{v}_{i,2} - \hat{v}_{i,1} \leq 0$, so that $\hat{\mathcal{U}}^S_{i,3} - \hat{\mathcal{U}}^S_{i,2} \leq 0$, thus $\hat{v}_{i,3} - \hat{v}_{i,2} \leq 0$, and so forth. This results in the contradiction that $0 < m_s = \hat{v}_{i,P} \leq \hat{v}_{i,1} \leq 0$. Therefore, $\hat{v}_{i,1} > 0$. Now, assume that $k \geq 2$. By construction, $\hat{v}_{i,k-1} > 0$, thus $\hat{v}_{i,k} - \hat{v}_{i,1} > 0$. But then $0 < \hat{v}_{i,1} < \hat{v}_{i,k} \leq 0$ is a contradiction. Therefore, $\hat{v}_{i,p} > 0 \ \forall \ i,p$ must hold. Both the Constant and Streak incentive scheme thus increase an agent's expected meditation frequency. ■

Proof of Proposition 2 (Single crossing) ← Recall that the expected meditation frequencies under the Constant and Streak scheme equal $\mathcal{F}^C_i = \frac{\beta_i(b_i+m_c)}{\bar{c}_i}$ and $\mathcal{F}^S_i = \sum_{p=1}^{P} q_{i,p}\mathcal{F}^S_{i,p}$ with $\mathcal{F}^S_{i,p} = \frac{\beta_i(b_i+\hat{v}_{i,p})}{\bar{c}_i}$ (cf. Section 2.2.1, and (A1) in Appendix A.1).

We now show that for any type i, i has the same expected meditation frequency under the Constant and Streak incentive scheme if and only if $b_i = b_i^*(\beta_i, \hat{\beta}_i, \bar{c}, m_c, m_s)$, and that $\mathcal{F}_i^S > \mathcal{F}_i^C$ if and only if $b_i > b_i^*$ (if b_i^* exists). To do so, we show that the sufficient condition $\frac{\partial \mathcal{F}_i^S}{\partial b_i} > \frac{\partial \mathcal{F}_i^C}{\partial b_i}$ must hold for all i. Recall that $\max\{m_c, m_s\} + b_i < \bar{c}_i \; \forall \; i$ by assumption. For Constant, one immediately obtains $\frac{\partial \mathcal{F}_i^C}{\partial b_i} = \frac{\beta_i}{\bar{c}_i}$.

For Streak, we take two steps. First, note that the meditation frequency under a given streak period p increases in b_i by $\frac{\partial \mathcal{F}_{i,p}^S}{\partial b_i} = \frac{\beta_i(1+\frac{\partial \hat{v}_{i,p}}{\partial b_i})}{\bar{c}_i}$, so that $\frac{\partial \mathcal{F}_{i,p}^S}{\partial b_i} > \frac{\partial \mathcal{F}_i^C}{\partial b_i}$ if $\frac{\partial \hat{v}_{i,p}}{\partial b_i} > 0 \; \forall \; p \leq P-1$. The proof for the latter condition is by contradiction. Assume that $\exists p \leq P-1 : \frac{\partial \hat{v}_{i,p}}{\partial b_i} \leq 0$. Define by k the lowest p for which this is the case. If $k = 1$, then sequentially for all $p \in \{1, 2, \ldots, P-1\}$, $\frac{\partial \hat{v}_{i,p}}{\partial b_i} = \frac{\partial(\hat{\mathcal{U}}_{i,p+1}^S - \hat{\mathcal{U}}_{i,1}^S)}{\partial b_i} = \frac{1}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i\left(\hat{v}_{i,p+1} - \hat{v}_{i,1} + b_i(\frac{\partial \hat{v}_{i,p+1}}{\partial b_i} - \frac{\partial \hat{v}_{i,1}}{\partial b_i}) + 2(\hat{v}_{i,p+1}\frac{\partial \hat{v}_{i,p+1}}{\partial b_i} - \hat{v}_{i,1}\frac{\partial \hat{v}_{i,1}}{\partial b_i})\right) \leq 0$ implies that $\frac{\partial \hat{v}_{i,p+1}}{\partial b_i} < 0$ as $\hat{v}_{i,p+1} > \hat{v}_{i,1}$ (see below). However, $\frac{\partial \hat{v}_{i,P}}{\partial b_i} = 0$, yielding a contradiction. Therefore, $\frac{\partial \hat{v}_{i,1}}{\partial b_i} > 0$. Similarly, if $k \geq 2$, then sequentially for all $p \in \{k, \ldots, P-1\}$, $\frac{\partial \hat{v}_{i,p}}{\partial b_i} - \frac{\partial \hat{v}_{i,k-1}}{\partial b_i} = \frac{\partial(\hat{\mathcal{U}}_{i,p+1}^S - \hat{\mathcal{U}}_{i,k}^S)}{\partial b_i} = \frac{1}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i\left(\hat{v}_{i,p+1} - \hat{v}_{i,k} + b_i(\frac{\partial \hat{v}_{i,p+1}}{\partial b_i} - \frac{\partial \hat{v}_{i,k}}{\partial b_i}) + 2(\hat{v}_{i,p+1}\frac{\partial \hat{v}_{i,p+1}}{\partial b_i} - \hat{v}_{i,k}\frac{\partial \hat{v}_{i,k}}{\partial b_i})\right) \leq 0$ implies that $\frac{\partial \hat{v}_{i,p+1}}{\partial b_i} < 0$ as $\hat{v}_{i,p+1} > \hat{v}_{i,k}$ (see below), again yielding a contradiction as $\frac{\partial \hat{v}_{i,P}}{\partial b_i} = 0$. Therefore, $\frac{\partial \hat{v}_{i,p}}{\partial b_i} > 0 \; \forall \; p \leq P-1$.

Second, an increase in b_i changes the frequency with which agent i is in a given streak period. As $q_{i,p+1} = q_{i,p}\mathcal{F}_{i,p}^S$, a ceteris paribus increase in $\mathcal{F}_{i,p}^S$ for any $p < P$ increases the frequency of being in a streak period $k > p$, $q_{i,k}$. Thus, if $\mathcal{F}_{i,k}^S > \mathcal{F}_{i,p}^S \; \forall \; k > p$, this shift increases meditation frequency. We now proof that this is the case by contradiction. Assume that there is a $k \geq 2$ s.t. $\mathcal{F}_{i,k}^S > \mathcal{F}_{i,k+1}^S$. Then $\hat{v}_{i,k} > \hat{v}_{i,k+1}$. It follows that $\hat{v}_{i,k+j} > \hat{v}_{i,k+1+j} \; \forall \; 1 \leq j \leq P-k-1$. However, $\hat{v}_{i,1} < \hat{v}_{i,2}$ implies $\hat{v}_{i,1+j} < \hat{v}_{i,2+j} \; \forall \; 1 \leq j \leq P-2$, yielding a contradiction. If instead $\hat{v}_{i,1} > \hat{v}_{i,2}$, then it follows that $\hat{v}_{i,1} < 0$, which is impossible (Proof of Proposition 1). Therefore, $\hat{v}_{i,k} > \hat{v}_{i,p} \; \forall \; k > p$ and thus $\mathcal{F}_{i,k}^S > \mathcal{F}_{i,p}^S \; \forall \; k > p$.

Taken together, if b_i^* exists, then any agent i has the same expected meditation frequency under the Constant and Streak incentive scheme if and only if $b_i = b_i^*(\beta_i, \hat{\beta}_i, \bar{c}, m_c, m_s)$, and has a higher (lower) expected meditation frequency under the Streak than the Constant incentive scheme if and only if $b_i > b_i^*$ ($b_i < b_i^*$). ■

Proof of Proposition 3 (Sorting) ← Recall that the perceived expected per-period utilities at $t = 0$ under the Constant and Streak incentive scheme equal $\hat{\mathcal{U}}_i^C = \frac{\beta_i}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i(b_i + m_c)^2$ and $\hat{\mathcal{U}}_i^S = \frac{\beta_i}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i(b_i + \hat{v}_{i,1})^2$ ((A4) and (A7) in Appendix A.2). All agents for whom $\hat{v}_{i,1} < m_c$ thus choose the Constant and all agents with $\hat{v}_{i,1} > m_c$ choose the Streak incentive scheme. As $\frac{\partial \hat{v}_{i,1}}{\partial b_i} > 0 \; \forall \; i$ (Proof of Proposition 2), for any i there exists at most one b_i, namely $b_i = b_i'(\hat{\beta}_i, \bar{c}, m_c, m_s)$, such that she is indifferent between the Constant and Streak incentive scheme, and all agents with $b_i < b_i'$ choose the Constant and all agents with $b_i > b_i'$ choose the Streak incentive scheme. ■

Proof of Proposition 4 (Frequency) ← First, recall from (Proposition 3) that all agents with $b_i < b_i'$ choose the Constant incentive scheme and all agents with $b_i > b_i'$ choose the Streak incentive scheme. Further, recall that $\mathcal{F}^{Ra} = \frac{1}{N}(\sum_i \alpha \mathcal{F}_i^C + (1-\alpha)\mathcal{F}_i^S)$ and $\mathcal{F}^{Ch} = \frac{1}{N}(\sum_{i:b_i<b_i'} \mathcal{F}_i^C + \sum_{i:b_i \geq b_i'} \mathcal{F}_i^S)$ (cf. Sections 2.2.2 and 2.2.3).

Condition 1: As $\sum_i \mathcal{F}_i^C \geq \sum_i \mathcal{F}_i^S$ by assumption, $\mathcal{F}^{Ra} \leq \sum_i \mathcal{F}_i^C$. Therefore, $\mathcal{F}^{Ch} > \mathcal{F}^{Ra}$ if $\sum_{i:b_i \geq b_i'} \mathcal{F}_i^S - \mathcal{F}_i^C > 0$. As $\frac{\partial \hat{v}_{i,p}}{\partial p} > 0$ (Proof of Proposition 2), $\mathcal{F}_{i,k}^S > \mathcal{F}_{i,1}^S \; \forall \; k \geq 2$, thus $\mathcal{F}_i^S > \mathcal{F}_{i,1}^S$. By Proposition 3, it holds that $\hat{v}_{i,1} \geq m_c \; \forall \; i : b_i \geq b_i'$, so that $\mathcal{F}_{i,1}^S \geq \mathcal{F}_i^C \; \forall \; i : b_i \geq b_i'$. Therefore, $\mathcal{F}_i^S > \mathcal{F}_i^C \; \forall \; i : b_i \geq b_i'$, implying that $\mathcal{F}^{Ch} > \mathcal{F}^{Ra}$.

Condition 2: Define $\mathcal{D}_i = \mathcal{F}_i^S - \mathcal{F}_i^C$. Reformulate $\mathcal{F}^{Ch} = \frac{1}{N}(\sum_i \mathcal{F}_i^C + \sum_{i:b_i \geq b_i'} \mathcal{D}_i)$ and $\mathcal{F}^{Ra} = \frac{1}{N}(\sum_i \mathcal{F}_i^C + \sum_i (1-\alpha)\mathcal{D}_i)$. Thus $\mathcal{F}^{Ch} - \mathcal{F}^{Ra} = \frac{1}{N}(\sum_{i:b_i \geq b_i'} \mathcal{D}_i - \sum_i (1-\alpha)\mathcal{D}_i) = \frac{|\{i:b_i \geq b_i'\}|}{N}\mathbb{E}[D_i | b_i \geq b_i'] - \frac{1-\alpha}{N}\mathcal{D}_i$. As $\frac{\partial \mathcal{D}_i}{\partial b_i} > 0 \; \forall \; i$ (Proof of Proposition 2) and independence of b_i, $\bar{c}_i$ and $(\beta_i, \hat{\beta}_i)$ by assumption, $\mathbb{E}[D_i | b_i \geq b_i'] > \mathbb{E}[D_i]$. Further, as $D_i > 0 \; \forall \; i : b_i \geq b_i'$ and $\alpha \geq |\{i : b_i < b_i'\}|$ by assumption, $\mathcal{F}^{Ch} - \mathcal{F}^{Ra} > 0$.

Therefore, letting agents choose their incentive scheme yields a higher average expected meditation frequency than exogenously assigning agents to incentive schemes if Condition 1 or 2 are satisfied. ■

Proof of Proposition A1 (Incentive effect on Utility) ← Constant: $\mathcal{U}_i^C = \frac{1}{2\bar{c}_i}(2-\beta_i)\beta_i(b_i + m_c)^2 > \frac{1}{2\bar{c}_i}(2-\beta_i)\beta_i b_i^2 = \mathcal{U}_i^B$ as $m_c > 0$ and $b_i \geq 0$ by assumption ((A2) and (A3)). Streak: $\mathcal{U}_i^S - \mathcal{U}_i^B = \sum_p^{P-1} q_{i,p}(\mathcal{U}_{i,p}^S - \hat{v}_{i,p}\mathcal{F}_{i,p}^S - \mathcal{U}_i^B) + q_{i,P}(\mathcal{U}_{i,P}^S - \mathcal{U}_i^B)$ ((A2) and (A8)) can be transformed to $\mathcal{U}_i^S - \mathcal{U}_i^B = q_{i,p}(\mathcal{U}_{i,1}^S - \mathcal{U}_i^B) + \sum_{p=2}^P q_{i,p}(\mathcal{U}_{i,p}^S - \hat{v}_{i,p-1}\mathcal{F}_{i,p-1}^S - \mathcal{U}_i^B)$. We now show that every term in the brackets is strictly positive. Clearly, $\mathcal{U}_{i,1}^S = \frac{1}{2\bar{c}_i}(2-\beta_i)\beta_i(b_i + \hat{v}_{i,1})^2 > \frac{1}{2\bar{c}_i}(2-\beta_i)\beta_i b_i^2 = \mathcal{U}_i^B$. For any $p \geq 2$, $\mathcal{U}_{i,p}^S - \hat{v}_{i,p-1}\mathcal{F}_{i,p-1}^S - \mathcal{U}_i^B$ simplifies to $\frac{1}{2\bar{c}_i}\beta_i\left((2-\beta_i)(2b_i\hat{v}_{i,p} + \hat{v}_{i,p}^2) - 2b_i\hat{v}_{i,p-1} - 2\hat{v}_{i,p-1}^2\right)$, which is strictly positive if $\hat{v}_{i,p-1} < \frac{1}{2}\left(\sqrt{b_i^2 + 4b_i\hat{v}_{i,p} + 2\hat{v}_{i,p}^2} - b_i\right)$. This condition is always fulfilled as $\hat{v}_{i,p-1} = \mathcal{U}_{i,p}^S - \mathcal{U}_{i,1}^S = \frac{1}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i(2b_i\hat{v}_{i,p} + \hat{v}_{i,p}^2 - 2b_i\hat{v}_{i,1} - \hat{v}_{i,1}^2) \leq \frac{2b_i\hat{v}_{i,p} + \hat{v}_{i,p}^2}{2(b_i + \hat{v}_{i,p})} < \frac{1}{2}\left(\sqrt{b_i^2 + 4b_i\hat{v}_{i,p} + 2\hat{v}_{i,p}^2} - b_i\right)$. Therefore, both the Constant and Streak incentive scheme increase an agent's expected utility.

■

Proof of Lemma A1 (Comparative Statics of b_i^*) $\leftarrow$ Recall that the expected meditation frequencies under the Constant and Streak scheme equal $\mathcal{F}_i^C = \frac{\beta_i(b_i+m_c)}{\bar{c}_i}$ (cf. Section 2.2.1) and $\mathcal{F}_i^S = \sum_{p=1}^P q_{i,p}\mathcal{F}_{i,p}^S = \sum_{p=1}^P q_{i,p}\frac{\beta_i(b_i+\hat{v}_{i,p})}{\bar{c}_i}$ (A1) with perceived option value $\hat{v}_{i,p} = \hat{\mathcal{U}}_{i,p+1}^S - \hat{\mathcal{U}}_{i,1}^S = \frac{1}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i(b_i+\hat{v}_{i,p+1})^2 - \frac{1}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i(b_i+\hat{v}_{i,1})^2 \;\forall\, p < P$ and $\hat{v}_{i,P} = m_s$ (cf. Appendix A.2). As $\frac{\partial(\mathcal{F}_i^S-\mathcal{F}_i^C)}{\partial m_s} > 0$ and $\frac{\partial(\mathcal{F}_i^S-\mathcal{F}_i^C)}{\partial m_c} < 0$, b_i^* decreases in m_s and increases in m_c.

For the comparative statics in β_i, $\hat{\beta}_i$ and $\bar{c}$, we split the proofs in two. First, an increase in β_i, $\hat{\beta}_i$ and $\bar{c}$ changes the frequency with which agent i is in a given streak period. As $q_{i,p+1} = q_{i,p}\mathcal{F}_{i,p}^S$, a ceteris paribus increase (decrease) in $\mathcal{F}_{i,p}^S$ for any $p < P$ increases (decreases) the frequency of being in a streak period $k > p$, $q_{i,k}$. As $\mathcal{F}_{i,k}^S > \mathcal{F}_{i,p}^S \;\forall\, k > p$ (cf. Proof of Proposition 2), this shift increases (decreases) meditation frequency. We now show that for any $p < P$ $\mathcal{F}_{i,p}^S$ increases in β_i and $\hat{\beta}_i$, and decreases in $\bar{c}$. For β_i, we have $\frac{\partial\mathcal{F}_{i,p}^S}{\partial\beta_i} > 0$ as $\hat{v}_{i,p} > 0$ (cf. Proof of Proposition 1) for all p, so that the shift increases frequency. Thus $\frac{\partial(\mathcal{F}_i^S-\mathcal{F}_i^C)}{\partial\beta_i} = \frac{1}{\bar{c}_i}\sum_{p=1}^P q_{i,p}(\hat{v}_{i,p}-m_c) + \frac{\beta_i}{\bar{c}_i}\sum_{p=1}^P \frac{\partial q_{i,p}}{\partial\beta_i}(\hat{v}_{i,p}-m_c) > 0$ for $b_i = b_i^*$ (for whom $\sum_{p=1}^P q_{i,p}(\hat{v}_{i,p}-m_c) = 0$), b_i^* decreases in β_i.

For $\hat{\beta}_i$, we have $\frac{\partial\mathcal{F}_{i,p}^S}{\partial\hat{\beta}_i} > 0$ if $\frac{\partial\hat{v}_{i,p}}{\partial\hat{\beta}_i} > 0$ for all $p < P$. Further, $\frac{\partial(\mathcal{F}_i^S-\mathcal{F}_i^C)}{\partial\hat{\beta}_i} = \frac{\beta_i}{\bar{c}_i}\sum_{p=1}^P q_{i,p}\frac{\partial\hat{v}_{i,p}}{\partial\hat{\beta}_i} + \frac{\partial q_{i,p}}{\partial\hat{\beta}_i}\hat{v}_{i,p} > 0$ if $\frac{\partial\hat{v}_{i,p}}{\partial\hat{\beta}_i} > 0$ for all $p < P$. We now show that $\frac{\partial\hat{v}_{i,p}}{\partial\hat{\beta}_i} > 0$ for all $2 \le p < P$ by contradiction (see Proof of Lemma A2 for $p = 1$). Assume that $\exists p : 2 \le p \le P-1 : \frac{\partial\hat{v}_{i,p}}{\partial\hat{\beta}_i} \le 0$. Define by k the lowest p for which this is the case. Sequentially for all $p \in \{k,\dots,P-1\}$, $\frac{\partial\hat{v}_{i,p}}{\partial\hat{\beta}_i} - \frac{\partial\hat{v}_{i,k-1}}{\partial\hat{\beta}_i} = \frac{\partial(\hat{\mathcal{U}}_{i,p+1}^S-\hat{\mathcal{U}}_{i,k}^S)}{\partial\hat{\beta}_i} = \frac{1}{2\bar{c}_i}(2-2\hat{\beta}_i)(2b_i(\hat{v}_{i,p+1}-\hat{v}_{i,k})+\hat{v}_{i,p+1}^2-\hat{v}_{i,k}^2)+\frac{1}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i(2b_i(\frac{\partial\hat{v}_{i,p+1}}{\partial\hat{\beta}_i} - \frac{\partial\hat{v}_{i,k}}{\partial\hat{\beta}_i}) + 2\hat{v}_{i,p+1}\frac{\partial\hat{v}_{i,p+1}}{\partial\hat{\beta}_i} - 2\hat{v}_{i,k}\frac{\partial\hat{v}_{i,k}}{\partial\hat{\beta}_i}) \le 0$ implies that $\frac{\partial\hat{v}_{i,p+1}}{\partial\hat{\beta}_i} < 0$ as $\hat{v}_{i,p+1} > \hat{v}_{i,k}$ (see Proof of Proposition 2), yielding a contradiction as $\frac{\partial\hat{v}_{i,P}}{\partial\hat{\beta}_i} = 0$. Therefore, $\frac{\partial\hat{v}_{i,p}}{\partial\hat{\beta}_i} > 0 \;\forall\, p \le P-1$. Thus, $\frac{\partial(\mathcal{F}_i^S-\mathcal{F}_i^C)}{\partial\hat{\beta}_i} > 0$, so b_i^* decreases in $\hat{\beta}_i$.

Similarly, for $\bar{c}_i$, we have $\frac{\partial\mathcal{F}_{i,p}^S}{\partial\bar{c}_i} < 0$ if $\frac{\partial\hat{v}_{i,p}}{\partial\bar{c}_i} < 0$ for all p. Further, $\frac{\partial(\mathcal{F}_i^S-\mathcal{F}_i^C)}{\partial\bar{c}_i} = \frac{\beta_i}{\bar{c}_i}\sum_{p=1}^P q_{i,p}\frac{\partial\hat{v}_{i,p}}{\partial\bar{c}_i} + \frac{\partial q_{i,p}}{\partial\bar{c}_i}\hat{v}_{i,p} - \frac{q_{i,p}\hat{v}_{i,p}}{\bar{c}_i} < 0$ if $\frac{\partial\hat{v}_{i,p}}{\partial\bar{c}_i} < 0$ for all p. We now show that $\frac{\partial\hat{v}_{i,p}}{\partial\bar{c}_i} < 0$ for all $2 \le p < P$ by contradiction (see Proof of Lemma A2 for $p = 1$). Assume that $\exists p : 2 \le p \le P-1 : \frac{\partial\hat{v}_{i,p}}{\partial\bar{c}_i} \ge 0$. Define by k the lowest p for which this is the case. Sequentially for all $p \in \{k,\dots,P-1\}$, $\frac{\partial\hat{v}_{i,p}}{\partial\bar{c}_i} - \frac{\partial\hat{v}_{i,k-1}}{\partial\bar{c}_i} = \frac{\partial(\hat{\mathcal{U}}_{i,p+1}^S-\hat{\mathcal{U}}_{i,k}^S)}{\partial\bar{c}_i} = -\frac{1}{2\bar{c}_i^2}(2-\hat{\beta}_i)\hat{\beta}_i(2b_i(\hat{v}_{i,p+1}-\hat{v}_{i,k}) + \hat{v}_{i,p+1}^2 - \hat{v}_{i,k}^2) + \frac{1}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i(2b_i(\frac{\partial\hat{v}_{i,p+1}}{\partial\bar{c}_i} - \frac{\partial\hat{v}_{i,k}}{\partial\bar{c}_i}) + 2\hat{v}_{i,p+1}\frac{\partial\hat{v}_{i,p+1}}{\partial\bar{c}_i} - 2\hat{v}_{i,k}\frac{\partial\hat{v}_{i,k}}{\partial\bar{c}_i}) \ge 0$ implies that $\frac{\partial\hat{v}_{i,p+1}}{\partial\bar{c}_i} > 0$ as $\hat{v}_{i,p+1} > \hat{v}_{i,k}$ (see Proof of Proposition 2), yielding a contradiction as $\frac{\partial\hat{v}_{i,P}}{\partial\bar{c}_i} = 0$. Therefore, $\frac{\partial\hat{v}_{i,p}}{\partial\bar{c}_i} < 0 \;\forall\, p \le P-1$. Thus, $\frac{\partial(\mathcal{F}_i^S-\mathcal{F}_i^C)}{\partial\bar{c}_i} < 0$, so b_i^* increases in $\bar{c}_i$. ∎

Proof of Lemma A2 (Comparative Statics of b_i') ← Recall that $\hat{\mathcal{U}}_i^C = \frac{\beta_i}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i(b_i+m_c)^2$ (A4) and $\hat{\mathcal{U}}_i^S = \frac{\beta_i}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i(b_i+\hat{v}_{i,1})^2$ (A7). As $\frac{\partial(\hat{\mathcal{U}}_i^S-\hat{\mathcal{U}}_i^C)}{\partial m_s} > 0$ and $\frac{\partial(\hat{\mathcal{U}}_i^S-\hat{\mathcal{U}}_i^C)}{\partial m_c} < 0$, b_i' decreases in m_s and increases in m_c. Note that $b_i = b_i'$ implies that $\hat{v}_{i,1} = m_c$. Therefore, b_i' increases in $\bar{c}_i$ if $\frac{\hat{v}_{i,1}}{\partial \bar{c}_i} < 0$. The proof is by contradiction. Assume that $\frac{\partial \hat{v}_{i,1}}{\partial \bar{c}_i} \geq 0$. Then $\frac{\partial \hat{v}_{i,1}}{\partial \bar{c}_i} = -\frac{1}{2\bar{c}_i^2}(2-\hat{\beta}_i)\hat{\beta}_i(2b_i(\hat{v}_{i,2}-\hat{v}_{i,1})+\hat{v}_{i,2}^2-\hat{v}_{i,1}^2)+\frac{1}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i(2b_i(\frac{\partial \hat{v}_{i,2}}{\partial \bar{c}_i}-\frac{\partial \hat{v}_{i,1}}{\partial \bar{c}_i})+2\hat{v}_{i,2}\frac{\partial \hat{v}_{i,2}}{\partial \bar{c}_i}-2\hat{v}_{i,1}\frac{\partial \hat{v}_{i,1}}{\partial \bar{c}_i}) \geq 0$ implies that $\frac{\partial \hat{v}_{i,2}}{\partial \bar{c}_i} > 0$ as $\hat{v}_{i,p} > 0 \;\forall\; p$ (Proof of Proposition 1) and $\hat{v}_{i,k} > \hat{v}_{i,p} \;\forall\; k > p$ (Proof of Proposition 2). Sequentially, it follows that $\frac{\partial \hat{v}_{i,p}}{\partial \bar{c}_i} > 0 \;\forall\; p \geq 3$. However, $\frac{\partial \hat{v}_{i,P}}{\partial \bar{c}_i} = \frac{\partial m_s}{\partial \bar{c}_i} = 0$, yielding a contradiction. Therefore, $\frac{\partial \hat{v}_{i,1}}{\partial \bar{c}_i} < 0$, so b_i' increases in $\bar{c}_i$. Similarly, b_i' decreases in $\hat{\beta}_i$ if $\frac{\hat{v}_{i,1}}{\partial \hat{\beta}_i} > 0$. The proof is again by contradiction. Assume that $\frac{\partial \hat{v}_{i,1}}{\partial \hat{\beta}_i} \leq 0$. Then $\frac{\partial \hat{v}_{i,1}}{\partial \hat{\beta}_i} = \frac{1}{2\bar{c}_i}(2-2\hat{\beta}_i)(2b_i(\hat{v}_{i,2}-\hat{v}_{i,1})+\hat{v}_{i,2}^2-\hat{v}_{i,1}^2)+\frac{1}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i(2b_i(\frac{\partial \hat{v}_{i,2}}{\partial \hat{\beta}_i}-\frac{\partial \hat{v}_{i,1}}{\partial \hat{\beta}_i})+2\hat{v}_{i,2}\frac{\partial \hat{v}_{i,2}}{\partial \hat{\beta}_i}-2\hat{v}_{i,1}\frac{\partial \hat{v}_{i,1}}{\partial \hat{\beta}_i}) \leq 0$ implies that $\frac{\partial \hat{v}_{i,2}}{\partial \hat{\beta}_i} < 0$ as $\hat{v}_{i,p} > 0 \;\forall\; p$ (Proof of Proposition 1) and $\hat{v}_{i,k} > \hat{v}_{i,p} \;\forall\; k > p$ (Proof of Proposition 2). Sequentially, it follows that $\frac{\partial \hat{v}_{i,p}}{\partial \hat{\beta}_i} < 0 \;\forall\; p \geq 3$. However, $\frac{\partial \hat{v}_{i,P}}{\partial \hat{\beta}_i} = \frac{\partial m_s}{\partial \hat{\beta}_i} = 0$, yielding a contradiction. Therefore, $\frac{\partial \hat{v}_{i,1}}{\partial \hat{\beta}_i} > 0$, so b_i' decreases in $\hat{\beta}_i$. ∎

Proof of Lemma A3 (Comparing b_i' and b_i') ← Recall that $\hat{\mathcal{U}}_i^C = \frac{\beta_i}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i(b_i + m_c)^2$ (A4) and $\hat{\mathcal{U}}_i^S = \frac{\beta_i}{2\bar{c}_i}(2-\hat{\beta}_i)\hat{\beta}_i(b_i+\hat{v}_{i,1})^2$ (A7). Thus, $\hat{v}_{i,1} = m_c$ holds for any agent that is indifferent between choosing the Constant and Streak incentive scheme. Therefore, the meditation frequency under the Constant scheme, $\frac{\beta_i(b_i+m_c)}{\bar{c}_i}$ (cf. Section 2.2.1), equals the meditation frequency in first streak-periods under the Streak scheme, $\frac{\beta_i(b_i+\hat{v}_{i,1})}{\bar{c}_i}$ (cf. A1) for any type $i : \hat{v}_{i,1} = m_c$. As $\hat{v}_{i,k} > \hat{v}_{i,p} \;\forall\; k > p$ (Proof of Proposition 2), every agent's expected meditation frequency increases in the streak-period. Therefore, it holds that $\mathcal{F}_i^S = \sum_{p=1}^{P} q_{i,p}\mathcal{F}_{i,p}^S > \mathcal{F}_i^C$ for any type $i : \hat{v}_{i,1} = m_c$. It follows that $b_i^* < b_i' \;\forall\; i$. ∎

A.5 Welfare

The main text assumes that the policy maker tries to maximize average meditation frequency. Instead of frequency, a policy maker might also try to maximize aggregate welfare. This section shows that our results in the main text also carry over to this setting.

An agent's behavior yields a per-period welfare of $\mathcal{W}_{it} = b_i - c_{it}$ if she meditates and $\mathcal{W}_{it} = 0$ if she does not meditate. Under the Constant incentive scheme, expected per-period welfare thus equals

$$\mathcal{W}_i^C = \int_0^{\beta_i(b_i+m_c)} (b_i - c_{it})dc_{it} = \frac{1}{2\bar{c}_i}\beta_i(b_i+m_c)((2-\beta_i)b_i - \beta_i m_c). \tag{1}$$

The expected per-period welfare under the Streak incentive scheme equals

$$\mathcal{W}_i^S = \sum_p q_{i,p} \int_0^{\beta_i(b_i+\hat{v}_{i,p})} (b_i - c_{it}) dc_{it} = \sum_p q_{i,p} \left(\frac{1}{2\bar{c}_i} \beta_i (b_i + \hat{v}_{i,p})((2-\beta_i)b_i - \beta_i \hat{v}_{i,p}) \right). \quad (2)$$

We now show that the single-crossing result about meditation frequency (Proposition 2) carries over to welfare.[49]

Proposition A2 (Single crossing – Welfare) *If* $m_s \leq \frac{(1-\beta_i)b_i}{\beta_i}$*, there is an agent-specific threshold* $b_i^*(\beta_i, \hat{\beta}_i, \bar{c}_i, m_c, m_s)$ *such that for* $b_i < b_i^*$ *the expected welfare is larger under the Constant scheme, and vice-versa for* $b_i > b_i^*$*.*

The proposition implies that welfare can be increased if agents with high meditation benefits are incentivized with the Streak and agents with low benefits with the Constant incentive scheme as long as the inefficiency $(1-\beta_i)b_i$ is sufficiently large compared to the Streak reward. Arguably, the condition is not very restrictive for the following two reasons. First, it is only a sufficient condition and slight overmeditation in last streak-periods would be overcompensated by less undermeditation in earlier streak-periods. Second, if agents are not time-inconsistent, then there is little reason for a policy maker to even intervene in the first place. If the inefficiency is relatively too small, then welfare under a Streak incentive scheme no longer monotonously increases in meditation benefits as agents with high benefits meditate excessively in last streak-periods.

In order to derive results for the effect of choice on welfare, we also need to consider how agents choose their incentive schemes. As agents are selfish and thus only care about their own utility, they are ignorant towards whether the policy maker cares about meditation frequency or welfare, which implies that Proposition 3 still holds under a welfare objective. Similar to a frequency objective, there is also a wedge between the welfare-maximizing threshold b_i^{**} and the actual separating threshold b'. As for frequency, we can easily infer that $b_i^{**} < b_i'$. Recall that any agent that is indifferent between choosing the Constant and Streak incentive scheme has $\hat{v}_{i,1} = m_c$ (see Appendix A.2). The welfare created under the Constant scheme is thus equal to the welfare in first streak-periods under the Streak scheme. As welfare increases in the streak-period (Proof of Proposition A2), all indifferent agents therefore create a higher welfare under Streak than Constant, implying

[49] As for frequency, we assume that not for all types welfare is higher under Constant nor Streak in order to make the policy maker's decision between exogenous assignment and choice non-trivial.

$b_i^{**} < b_i'$. Agents in the interval (b_i^{**}, b_i') therefore choose Constant but ought to choose Streak from an overall welfare perspective. Interestingly, this wedge is smaller for welfare than frequency, i.e. $b_i^* < b_i^{**}$ as $\mathcal{F}_{i,p}^S$ (cf. A1) increases linearly in $\hat{v}_{i,p}$ while $\mathcal{W}_{i,p}^S$ (cf. (2)) increases only concavely in $\hat{v}_{i,p}$.

Given these results, we can now derive the welfare consequences of offering agents a choice between the Constant and Streak incentive scheme. Similar to meditation frequency, there are a two sufficient conditions under which the chosen allocation is assured to perform better than the random allocation:

Condition A1. The Constant scheme yields weakly higher average welfare than the Streak incentive scheme in the *random allocation*, i.e. $\sum_i \mathcal{W}_i^C \geq \sum_i \mathcal{W}_i^S$.

Condition 2. Agents' benefits, time preferences and cost function are independent from each other, and the share α in the *random allocation* is at least as high as the share endogenously arising in the *chosen allocation*, i.e. $\alpha \geq \frac{|\{i: b_i < b_i'\}|}{N}$.

Proposition A3 (Welfare) *If Condition B1 or Condition 2 are satisfied and* $m_s < \frac{(1-\beta_i)b_i}{\beta_i} \; \forall \; i$, *then letting agents choose their incentive scheme yields a higher average expected welfare than exogenously assigning agents to incentive schemes.*

The proposition implies that offering agents a choice between Constant and Streak not only increases meditation frequency but also welfare if certain very similar conditions are met and the inefficiency in agents' baseline behavior is sufficiently large. Their similarities justify using frequency as a more easily observed proxy for welfare.

A.6 Proofs Welfare

Proof of Proposition A2 (Single crossing – Welfare) We now show that for any type $i : m_s \leq \frac{(1-\beta_i)b_i}{\beta_i}$, expected welfare is equal under the Constant and Streak incentive scheme if and only if $b_i = b_i^{**}(\beta_i, \hat{\beta}_i, \bar{c}_i, m_c, m_s)$, and that $\mathcal{W}_i^S > \mathcal{W}_i^C$ if and only if $b_i > b_i^{**}$ (if b_i^{**} exists). To do so, we show that for any type $i : m_s \leq \frac{(1-\beta_i)b_i}{\beta_i}$ it holds that $\mathcal{W}_i^S < \mathcal{W}_i^C$ if $\sum_p q_{i,p}\hat{v}_{i,p} \leq m_c$ and $\frac{\partial \mathcal{W}_i^S}{\partial b_i} > \frac{\partial \mathcal{W}_i^C}{\partial b_i}$ if $\sum_p q_{i,p}\hat{v}_{i,p} \geq m_c$. Note that for any $i : \sum_p q_{i,p}\hat{v}_{i,p} \leq m_c$ $\mathcal{W}_i^S$ is maximized if $\sum_p q_{i,p}\hat{v}_{i,p} = m_c$ as $\hat{v}_{i,k} > \hat{v}_{i,p} \; \forall \; k > p$ (Proof of Proposition 2) and $\frac{\partial \mathcal{W}_{i,p}^S}{\partial \hat{v}_{i,p}} = \frac{\beta_i}{\bar{c}_i}((1-\beta_i)b_i - \beta_i \hat{v}_{i,p}) \geq 0 \; \forall \; p$. Subtracting (1) from (2) and substituting $\sum_p q_{i,p}\hat{v}_{i,p} = m_c$ yields $\mathcal{W}_i^S - \mathcal{W}_i^C = \frac{\beta^2}{2\bar{c}_i}(m_c^2 - \sum_p q_{i,p}\hat{v}_{i,p}^2) = \frac{\beta^2}{2\bar{c}_i}((\sum_p q_{i,p}\hat{v}_{i,p})^2 - \sum_p q_{i,p}\hat{v}_{i,p}^2) < 0$.

Further, we show that $\frac{\partial \mathcal{W}_i^S}{\partial b_i} > \frac{\partial \mathcal{W}_i^C}{\partial b_i}$ if $\sum_p q_{i,p}\hat{v}_{i,p} \geq m_c$. For Constant, one obtains $\frac{\partial \mathcal{W}_i^C}{\partial b_i} = \frac{\beta_i}{\bar{c}_i}((1-\beta_i)(b_i+m_c)+b_i)$. For Streak, we take two steps. First, welfare under a given streak period p increases in b_i by $\frac{\partial \mathcal{W}_{i,p}^S}{\partial b_i} = \frac{\beta_i}{\bar{c}_i}\left((1-\beta_i)(b_i+\hat{v}_{i,p}) + b_i + \frac{\partial \hat{v}_{i,p}}{\partial b_i}((1-\beta_i)b_i - \beta_i\hat{v}_{i,p})\right)$. As $\frac{\partial \hat{v}_{i,p}}{\partial b_i} > 0$ (Proof of Proposition 2) and $\hat{v}_{i,p} \leq m_s \leq \frac{(1-\beta_i)b_i}{\beta_i}$ for all $p \leq P-1$ by assumption, $\sum_p q_{i,p}\frac{\partial(\mathcal{W}_{i,p}^S - \mathcal{W}_i^C)}{\partial b_i} > 0$ if $\sum_p q_{i,p}\hat{v}_{i,p} \geq m_c$. Second, an increase in b_i changes the frequency with which agent i is in a given streak period. As $q_{i,p+1} = q_{i,p}\mathcal{F}_{i,p}^S$, a ceteris paribus increase in $\mathcal{F}_{i,p}^S$ for any $p < P$ increases the frequency of being in a streak period $k > p$, $q_{i,k}$. As $\hat{v}_{i,k} > \hat{v}_{i,p}\ \forall\ k > p$ (Proof of Proposition 2) and $\hat{v}_{i,p} \leq m_s \leq \frac{(1-\beta_i)b_i}{\beta_i}$ by assumption, $\frac{\partial \mathcal{W}_{i,p}^S}{\partial \hat{v}_{i,p}} = \frac{\beta_i}{\bar{c}_i}((1-\beta_i)b_i - \beta_i\hat{v}_{i,p}) > 0$, so that this shift increases expected welfare.

Taken together, if b_i^{**} exists, then expected welfare is equal under the Constant and Streak incentive scheme if and only if $b_i = b_i^{**}(\beta_i, \hat{\beta}_i, \bar{c}, m_c, m_s)$, and it is higher (lower) under the Streak than the Constant incentive scheme if and only if $b_i > b_i^{**}$ ($b_i < b_i^{**}$). ■

Proof of Proposition A3 (Welfare) The proof precisely follows that of Proposition 4 except for substituting $\mathcal{F}$ by $\mathcal{W}$ and referring to Proof of Proposition A2 rather than Proof of Proposition 2. ■

A.7 Optimal Rewards

Our results so far did not depend on whether the policy maker chooses rewards optimally and only required a certain single-crossing property, posing little informational requirements on the policy maker. In contrast, this section assumes that the policy maker knows agents' type distribution (while keeping agents' types private information), allowing us to analyze optimal reward levels. This analysis is trivial for a frequency-maximizing policy maker; any m_c and m_s that induces every agent to meditate in every period is optimal. We therefore concentrate our optimality analysis on a setting in which the policy maker aims to maximize welfare.

We first note that if the policy maker assigns agents exogenously, she will assign every agent into the same scheme, namely the one that yields higher aggregate welfare under the optimal reward levels. It is straightforward to derive the optimal Constant reward given (1). As $\frac{\partial \sum_i \mathcal{W}_i^C}{\partial m_c} = \sum_i \frac{\beta_i}{\bar{c}_i}\left((1-\beta_i)b_i - \beta_i m_c\right)$, the optimal Constant reward in an exogenous allocation equals

$$m_c^{**} = \frac{\sum_i \frac{\beta_i}{\bar{c}_i}(1-\beta_i)b_i}{\sum_i \frac{\beta_i}{\bar{c}_i}\beta_i}, \tag{3}$$

which is a weighted average of the individually optimal rewards $m^{**}_{c,i} = \frac{(1-\beta_i)b_i}{\beta_i}\ \forall\ i$. Unfortunately, there does generally not exist a closed-form solution for the welfare-maximizing Streak reward. It depends on the type distribution whether the optimal Constant or Streak incentive scheme yields higher aggregate welfare in an exogenous allocation.[50]

In many cases, a policy maker can increase average welfare by offering both the Constant and Streak schemes, keeping reward levels the same as in the exogenous allocation (cf. Proposition A3). However, knowing the type distribution, a policy maker can do better by offering a different menu of incentives. This menu features a larger spread between the Streak and Constant reward compared to optimal levels in the exogenous allocation as the policy maker no longer needs to accommodate reward levels to all individuals but can instead tailor the size of incentives to each group individually (though restricted by an incentive-compatibility constraint).

A.8 Externality

The analysis so far assumed that agents meditate inefficiently rarely without extra monetary incentives because of time inconsistency issues. In addition (or instead) to this internality, there might also be an externality at play. In this section, we assume that agents exert a positive linear externality $e > 0$ on the policy maker (e.g. due to lowering expected health care costs) whenever they meditate. Importantly, agents do not take this positive externality into account.

We now discuss whether and how our previous results change in this setting. Note that as agents do not take the positive externality into account, their meditation behavior as well as their actual and perceived utilities are unaltered by the introduction of the externality. This implies that all our results in the main text (cf. Propositions 1 to 4) are unchanged.

In contrast, our results about welfare in Appendix A.5 do slightly change when introducing an externality. An agent's behavior now yields a per-period welfare of $\mathcal{W}_{it} = b_i + e - c_{it}$ (rather than $\mathcal{W}_{it} = b_i - c_{it}$) if she meditates. Under the Constant incentive

[50]In practical terms, however, the optimal Constant scheme is likely to yield higher aggregate welfare than the optimal Streak scheme for two reasons. First, the Constant scheme typically yields a lower spread in individuals' meditation frequencies – a pattern that we also observe in our data (cf. Section 4.1) – and is therefore more robust to individuals' heterogeneity. Second, for a given meditation frequency, a Constant scheme yields higher welfare than a Streak scheme. This is because welfare loss is convex in the degree of inefficiency, which fluctuates by streak period but not in Constant.

scheme, expected per-period welfare thus now equals

$$\mathcal{W}_i^C = \int_0^{\beta_i(b_i+m_c)} (b_i + e - c_{it})dc_{it} = \frac{1}{2\overline{c}_i}\beta_i(b_i + m_c)((2-\beta_i)b_i + 2e - \beta_i m_c), \tag{4}$$

under the Constant and

$$\mathcal{W}_i^S = \sum_p q_{i,p} \int_0^{\beta_i(b_i+\hat{v}_{i,p})} (b_i + e - c_{it})dc_{it} = \sum_p q_{i,p} \left(\frac{1}{2\overline{c}_i}\beta_i(b_i + \hat{v}_{i,p})((2-\beta_i)b_i + 2e - \beta_i\hat{v}_{i,p})\right). \tag{5}$$

under the Streak incentive scheme. Note that these expressions coincide with (1) respectively (2) except for the added externality terms. Because of this similarity, the single crossing result (cf. Proposition A2) carries over to this setting, albeit with slight changes. First, adding an externality lowers the welfare-maximizing threshold to b_i^{***}, i.e. $b_i^{***} < b_i^{**}$ as it adds a linear component in $\hat{v}_{i,p}$ $(\frac{e}{\overline{c}_i}\hat{v}_{i,p})$ to the otherwise concave expression for welfare in a given streak period p (cf. Proof of Proposition A2). Second, the added externality weakens the sufficient condition about the maximal streak reward from $m_s \leq \frac{(1-\beta_i)b_i}{\beta_i}$ to $m_s \leq \frac{(1-\beta_i)b_i+e}{\beta_i}$, thus allowing for a wider range of streak reward sizes before overmeditation might occur. As agents' choices are unaffected by the introduction of an externality, these results imply that the chosen allocation is assured to perform better than the random allocation in terms of welfare if Condition A1 or Condition 2 are satisfied and $m_s \leq \frac{(1-\beta_i)b_i+e}{\beta_i}$ $\forall$ i.

To sum up, introducing an externality leaves results unchanged if the policy maker aims to maximize meditation frequency and increases the menu of incentive schemes under which choice increases welfare.

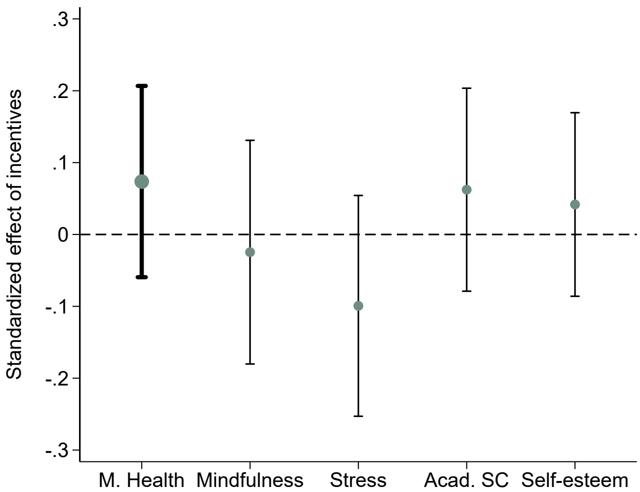
B Empirical Appendix

B.1 Mental Health Outcomes

This section discusses the effects of monetarily incentivizing subjects to meditate on several mental health outcomes. We elicited these outcomes in the baseline and endline surveys.

Figure B1 depicts the standardized effects of incentives along several mental-health-related dimensions. The figure shows that monetary incentives led to an increase of 0.07 standard deviations in our combined measure of mental health, which is, however, not significant ($p = 0.277$). Splitting up the combined measure into mindfulness level, perceived stress, academic self-concept and self-esteem, we observe that the incentives did not lead to a significant change in any of these measures.

Figure B1: Effect of Incentives on Mental Health Outcomes



Note: The figure depicts the standardized net effects of incentives on self-reported mental health, mindfulness, perceived stress, academic self-concept and self-esteem, controlling for baseline levels. Mental health is a combined measure of the other four outcome variables and is computed via a factor analysis. The black bars indicate 95% confidence intervals.

B.2 Long-term Effects on Meditation Frequency

While our experiment was not designed to measure long-term effects of monetary incentives on meditation behavior, data from our 100-day follow-up survey allow us to estimate post-intervention effects. This analysis is complicated by uneven attrition in the control group and incentivized treatments.[51] However, if we assume that every subject who did not report their meditation frequency does not meditate in a typical week,[52] we find that there is no significant effect of monetary incentives on weekly meditation frequency 100 days after the end of the intervention (0.69 vs. 0.56, $p = 0.342$ in the two-sided t-test). The lack of long-term effects is in line with the great majority of papers in the literature (e.g. Acland and Levy, 2015 & März, 2019; Carrera et al., 2018; Woerner, 2021).

[51] Only 61% of subjects in the control group reported their weekly meditation frequency in a typical week, while 77% did so in the incentivized treatments.

[52] This assumption is conservative, yet somewhat reasonable given that already 61% of subjects who completed the follow-up survey reported a meditation frequency of zero, and subjects who did not complete the follow-up survey completed much fewer meditation sessions during the intervention period (7.53 vs. 21.63, $p = 0.000$ in the two sided t-test), and had marginally significantly lower meditation benefits at baseline ($p = 0.079$ in the two sided t-test) than subjects who did report their weekly meditation frequency at follow-up.

B.3 Additional Tables and Figures

Table B1: Summary Statistics By Wave

	(1) First Wave	(2) Second Wave	(3) p-value (1) vs. (2)
Demographics			
Age	21.05	21.33	.31
Female (0/1)	.73	.64	.02
Bachelor student (0/1)	.82	.80	.45
Mental Health			
Mindfulness	3.23	3.30	.24
Perceived stress	20.42	20.02	.48
Academic self-concept	4.49	4.38	.25
Self-esteem	28.10	27.80	.52
Desirability of Control	4.57	4.56	.84
Economic Preferences			
Risk preferences	22.56	22.61	.96
Time preferences	36.57	37.52	.01
Meditation Behavior			
Intrinsic motivation to meditate	4.67	4.64	.79
Current weekly meditation frequency	0.39	0.48	.39
Meditation frequency goal	3.26	3.25	.98
Observations	288	211	

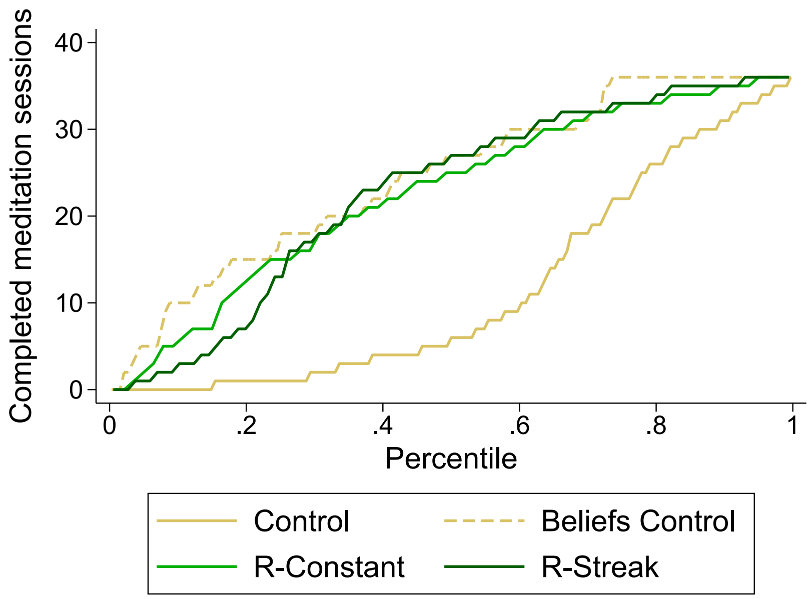
Note: Columns 1 and 2 depict means of first-wave respectively second-wave subjects. Column 3 shows the p-values from t-tests or tests of proportions with respect to the differences in means.

Table B2: Alternative Specifications

	Effect of Incentives		Effect of
	Constant	Streak	*Choice*
Mean of reference group	11.50	11.50	18.75
Wilcoxon-Mann-Whitney test	11.203	11.245	-3.975
	[0.000]	[0.000]	[0.017]
Permutation *t*-test	11.203	11.245	-3.975
	[0.000]	[0.000]	[0.004]

Note: The table shows estimates with p-values in brackets from Wilcoxon-Mann-Whitney and permutation t-tests for the effect of incentives (Constant and Streak) as well as the effect of *Choice*. The dependent variable is the number of completed meditation sessions during the 36-day intervention period. The reference group in the first two columns is subjects in *Control*, the reference group in the last two columns is subjects in *Random*. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure B2: Meditation Frequency over Percentiles



Note: The figure shows the meditation frequencies over percentiles in *Benefits* for subjects in *Control* and *Random*, split by incentive scheme. It also depicts beliefs about meditation frequency over percentiles in *Control*.

Table B3: Effect of Incentives and *Choice* by Wave

	Effect of Incentives		Effect of *Choice*	
Margin	Intensive	Extensive	Intensive	Extensive
Mean of reference group	11.032	.849	22.796	.968
Constant	12.675***	.936**		
	(2.071)	(.450)		
Streak	11.045***	.735**		
	(2.107)	(.357)		
Choice			-4.551**	-.611**
			(1.809)	(.303)
Wave	1.065	-.010	-.167	.054
	(1.888)	(.240)	(1.828)	(.397)
Constant * Wave	-3.496	-.142		
	(3.251)	(.658)		
Streak * Wave	.443	.211		
	(3.140)	(.581)		
Choice * Wave			1.415	.166
			(2.758)	(.486)
Observations	328	328	334	334
(Pseudo-) R^2	0.190	0.079	0.026	0.042

Note: The table shows OLS estimates in the first two columns and probit estimates in the last two columns. The dependent variable in the first and third column is the number of completed meditation sessions during the 36-day intervention period. The dependent variable in the second and fourth column indicates whether a subject completed at least one meditation session during the intervention period. The reference group in the first two columns is first-wave subjects in *Control*, the reference group in the last two columns is first-wave subjects in *Random*. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table B4: Effect of Incentives and *Choice* by Gender

	Effect of Incentives		Effect of *Choice*	
Margin	Intensive	Extensive	Intensive	Extensive
Mean of reference group	10.804	.839	17.978	.911
Constant	7.435**	.065		
	(2.956)	(.081)		
Streak	6.946**	.077		
	(2.969)	(.075)		
Choice			-3.563	-.024
			(2.496)	(.061)
Female	1.050	.014	6.556***	.080*
	(1.962)	(.060)	(2.034)	(.044)
Constant * Female	5.325	.081		
	(3.484)	(.088)		
Streak * Female	5.679	.055		
	(3.476)	(.084)		
Choice * Female			-.276	-.052
			(2.952)	(.067)
Observations	328	328	334	334
R^2	0.213	0.052	0.078	0.290

Note: The table shows OLS estimates. The dependent variable in the first and third column is the number of completed meditation sessions during the 36-day intervention period. The dependent variable in the second and fourth column indicates whether a subject completed at least one meditation session during the intervention period. The reference group in the first two columns is male subjects in *Control*, the reference group in the last two columns is male subjects in *Random*. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table B5: Net Effect of Streak by Meditation Benefits

	(1)
Standardized Meditation Benefits	.327
	(1.345)
Streak	.218
	(1.748)
Standardized Meditation Benefits * Streak	3.796**
	(1.860)
Constant	22.714***
	(1.293)
Observations	163
R^2	0.069

Note: The table shows OLS estimates for the net effect of Streak compared to Constant by *Benefits* for subjects in *Random*. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table B6: Heterogeneous Effects of *Choice*

	(1)	(2)
Standardized Desirability of Control	-.023	
	(.880)	
Meditate at baseline		-2.894
		(2.229)
Choice	-3.707***	-5.578***
	(1.365)	(1.513)
Standardized Desirability of Control * *Choice*	-1.119	
	(1.275)	
Meditate at baseline * *Choice*		8.471**
		(3.364)
Constant	22.724***	23.381***
	(.903)	(1.004)
Observations	334	334
R^2	0.030	0.043

Note: The table shows OLS estimates for the effect of *Choice* interacted with the standardized desirability of control measure (1) and a non-zero meditation frequency at baseline (2). The reference group is subjects in *Random*. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table B7: Meditation Frequency on 'Decisive Days'

	(1)	(2)	(3)
Mean of reference group	.631	.619	.611
'Decisive Day'	1.187***	-.073	-.253
	(.195)	(.172)	(.189)
Choice	-1.066***	-.504***	-.362
	(.223)	(.116)	(.098)
'Decisive Day' * *Choice*	.451	.022	.064
	(.284)	(.265)	(.274)
Lagged days	0	3	7
Observations	5220	4785	4205
(Pseudo-) R^2	0.190	0.079	0.026

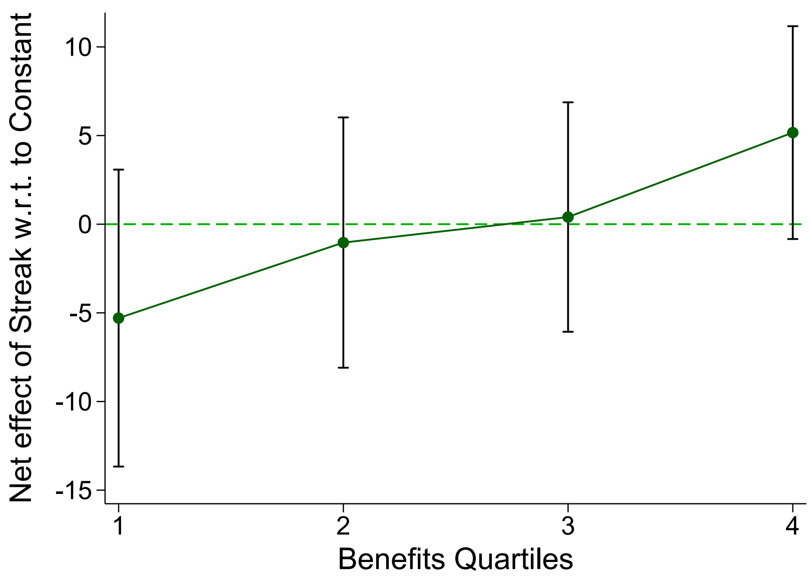
Note: The table shows logit estimates for the effect of 'decisive days' and *Choice* as well as their interaction term for subjects who have chosen the Constant incentive scheme. The reference group is subjects in *Random*-Constant. 'Decisive days' indicate days on which subjects could complete a 3-day streak. Robust standard errors clustered on the individual level are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table B8: Conveyed Information

	(1) *Random*	(2) *Choice*	(3) p-value (1) vs. (2)
1. How much do you think that the experimenters are interested in helping you meditate as often as possible?	4.400	4.609	.48
2. How much do you think the experimenters are interested in helping you find the meditation frequency that is best for you?	4.385	4.547	.62
3. How knowledgeable do you think the experimenters are in giving you rewards for completing the sessions?	5.508	5.297	.37
4. What do you think about the size of the rewards for the meditation sessions?	4.846	4.625	.31
Observations	65	64	

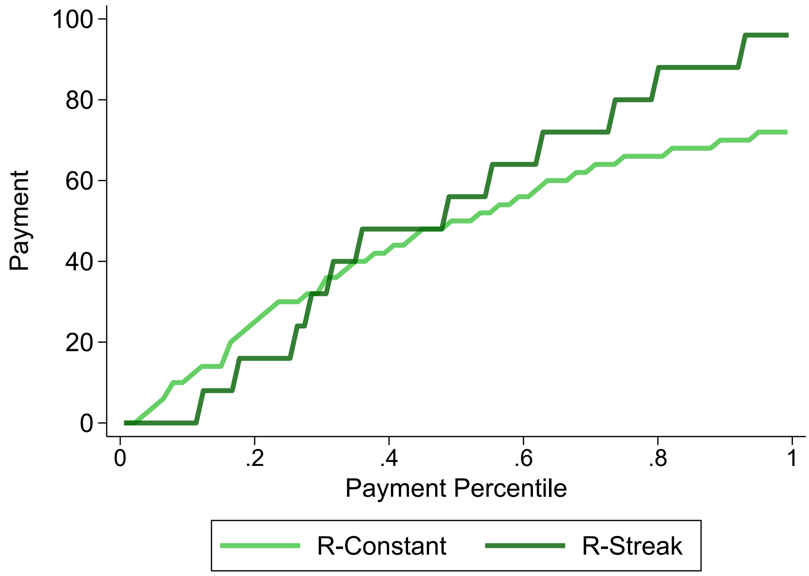
Note: Columns 1 and 2 depict means subjects in *Random* respectively *Choice*. Column 3 shows the p-values from t-tests with respect to the differences in means. Answers were reported on a 7-point Likert scale in the follow-up survey by second-wave subjects only. In questions 1-3 the scale goes from 1 (absolutely not) to 7 (absolutely/very much so). In question 4 the scale goes from 1 (very low) to 7 (very high). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure B3: Net Effect of Streak by Meditation Benefits



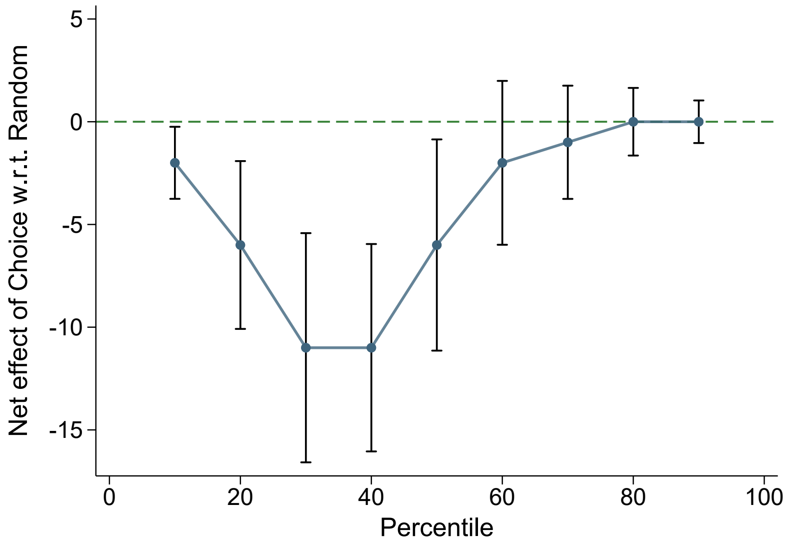
Note: The figure shows the net effect of Streak compared to Constant by *Benefits* quartile for subjects in *Random*. The black bars indicate 95% confidence intervals.

Figure B4: Distribution of Payments in *Random*



Note: The figure depicts the payment distributions across subjects randomly assigned to Constant and Streak.

Figure B5: Net Effect of *Choice* by Percentile



Note: The figure shows the net effect of *Choice* compared to *Random* by percentile of completed meditation sessions. The black bars indicate 95% confidence intervals.