# Learning Journal with Soft Commitment in Higher Education

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**ABSTRACT**

Procrastination affects up to 80% of university students, often hindering academic performance. To tackle this, we conducted a pre-registered field experiment with over 2,000 students at a German university, randomly assigning them to one of three groups: a semester-long online learning journal, the same journal coupled with a soft commitment device, or a control group. Analysis of administrative data reveals that the journal and commitment device group achieved significantly higher earned credits and GPA (standardized effect sizes of 0.075 and 0.12, respectively), whereas the journal-only group did not experience notable gains. These results underscore the importance of integrating commitment mechanisms into low-touch interventions, as they enhance accountability and maximize overall effectiveness. Further investigation into the mechanisms suggests a dual effect of the intervention: low-procrastinators experience long-term academic benefits, while high-procrastinators show short-term improvements in task initiation.

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## I. Introduction

Procrastination is widespread among university students, with estimates suggesting that over 80% delay academic tasks and up to 50% do so habitually in ways that harm performance (Steel, 2007; Klingsieck, 2013). It is associated with poorer academic outcomes[6], increased stress, and reduced well-being (Sirois, 2014; Beutel et al., 2016), and its effects are particularly pronounced in the transition to higher education, when self-regulation demands increase (Vosniadou, 2020). While a range of behavioral interventions has been proposed to address procrastination, most evidence comes from resource-intensive formats such as individualized therapy or coaching (Rozental et al., 2018), which are difficult to scale in large university cohorts. Scalable, low-touch interventions, particularly those using behavioral tools such as commitment devices, remain underexplored, even though theory and prior evidence suggest they can enhance student performance at minimal cost (Himmler et al., 2019).

This study evaluates whether a low-cost, easily scalable intervention—a learning journal provided either alone or supplemented with a soft commitment device—can reduce procrastination and enhance academic performance among university students. Procrastination is often driven by poor self-regulation, unclear goals, and time-inconsistent decision-making, such as present bias. To address these factors, the learning journal applies the mental contrasting with implementation intentions (MCII) framework, a structured approach that fosters self-regulation, planning, and reflective goal setting (Oettingen & Gollwitzer, 2010). A second treatment group incorporates a soft commitment device to test whether it enhances the learning journal's effectiveness. Soft commitment devices impose psychological costs for non-compliance, reinforcing adherence to planned goals (Bryan et al., 2010). Therefore, by improving accountability, the commitment device directly targets present-biased preferences and supports the self-regulatory benefits of the journal, offering a potentially more effective means of reducing procrastination.

We conducted a pre-registered[7] field experiment at a German higher education institution to study the effects of the learning journal and a commitment device intervention on educational outcomes. A complete cohort of over 2000 starting students was randomized into a control and two treatment groups. The control group received a placebo letter listing services offered by the university. Students in our first treatment group were additionally offered the opportunity to use a semester-long online learning journal. In our second treatment group, the learning journal additionally gives students the option to sign a voluntary target agreement[8], which lets them commit to the study time goals that they set for themselves in the learning journal. At the semester's end, we evaluate the intervention's impact on three pre-registered academic outcomes: persistence, course credits earned,

[6] In OECD countries, less than 40% of students complete their bachelor's degree on time, and within three years, 23% drop out (OECD, 2022).

[7] Link to the pre-registration: https://www.socialscienceregistry.org/trials/10147

[8] We inform the students that the target agreement is voluntary and carries no consequences if they fail to meet the goals, positioning it as a 'soft commitment device' as discussed by Bryan, Karlan, and Nelson (2010). Soft commitment devices rely on psychological or non-binding incentives to encourage individuals to meet goals, while hard commitment devices enforce behavior through explicit penalties for non-compliance (Bryan, Karlna and Nelson, 2010).



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**Commented [zo2R1]:** I condensed the first two paragraphs into one and emphasized the lack of evidence on scalable, low-touch interventions in higher education and the need for them in large student cohorts.

**Deleted:** Procrastination is a silent saboteur of long-term goals and remains a prevalent challenge in educational settings, where students often prioritize short-term comfort over necessary effort (Patterson, 2018). Studies estimate that over 80% of college students procrastinate, and up to 50% do it consistently and in a way that significantly impedes their academic progress (Steel, 2007; Klingsieck, 2013). Furthermore, procrastination is consistently linked to adverse outcomes, such as, increased stress (Sirois, 2014), and heightened depression and anxiety levels (Beutel et al., 2016). The transition to higher education amplifies these challenges, as students face greater demands for self-regulation (Vosniadou, 2020). Beyond individual consequences, procrastination also has societal costs, contributing to lower educational attainment, reduced workforce productivity, and long-term economic losses (Bound et al., 2012).

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Despite procrastination's widespread impact, most interventions depend on resource-intensive approaches—such as individualized therapy or one-on-one coaching—that are difficult to scale in large educational settings, and the supporting studies often rely on small, homogenous samples, limiting the generalizability of their findings (Rozental et al., 2018). While intensive interventions may help severe cases, scalable solutions—particularly using behavioral strategies like commitment devices (Himmler et al., 2019)—show promise but remain underexplored (Gallego et al., 2023).

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and Grade Point Average (GPA). Additionally, we examine underlying mechanisms and explore heterogeneous treatment effects based on students' baseline procrastination tendencies.

We find that offering a learning journal with a soft commitment device increases earned credits in the first semester by 0.85 credit points (effect size: 0.075 SD; *p*: 0.08). Moreover, students in that group had a significantly improved GPA compared to the control group, yielding an improvement of 0.12 SD (*p*: 0.012) in GPA by the end of the semester[9]. The improvements in both performance dimensions rules out students compromising their GPA for more credit points or vice versa. On the other hand, when offering the learning journal without a commitment device, we find no significant change in performance. This highlights the importance of incorporating a commitment mechanism into low-touch interventions, as it strengthens accountability, which in turn enhances the intervention's overall effectiveness.

In both treatment groups, approximately 50% of students accessed the treatment link at least once, while 18% in the second group opted to sign the commitment device. Since not all assigned students engaged with the learning journal, the intention to treat (ITT) estimates represent a lower bound for the intervention's average treatment effect on academic achievement. To better understand the impact of actively using the learning journal, beyond simply offering it, we estimated treatment-on-the-treated (TOT) effects. We defined treatment take-up as any student who opened the intervention link at least once, reflecting engagement with the treatment. The TOT analysis shows stronger effects in the second treatment group, where treated students earned 1.7 additional credits (0.15 SD, *p*: 0.07) and had better GPA (0.22 SD, $p < 0.01$), indicating a small to moderate treatment effect.

We expect treatment effects to vary depending on how much a student benefits from increased planning, goal setting, and commitment. Grohmann, Lakemann, and Seitz (2020) demonstrate that individuals with present-biased tendencies benefit more from calendar-based goal-setting interventions. Moreover, Himmler et al. (2019) present a theoretical model showing that commitment devices enhance student motivation by adding incentives tied to effort, improving short-term academic performance, particularly for procrastinators. Since procrastinators often exhibit present bias and low self-regulation (Patterson, 2015), we investigate pre-registered heterogeneous treatment effects based on students' procrastination tendencies[10].

The heterogeneity analysis of treatment effects reveals distinct outcomes based on students' procrastination tendencies. High procrastinators in the second treatment group earned significantly more credits (1.36 credits; *p*: 0.06) than those in the control group. Conversely, low procrastinators had a meaningful improvement in their GPA of 0.157 points ($p < 0.01$) and a 3 percentage-point reduction in dropout rates (*p*: 0.07) compared to the control group. These results suggest that the intervention helps high procrastinators by encouraging task initiation, as shown by their increased

[9] Enhancing student educational outcomes early in their academic journey is particularly important, as it can set a positive trajectory towards degree completion, as evidenced by the concept of academic momentum (Attewell et al., 2012).

[10] We use students' university application and matriculation dates as a proxy for procrastination, assuming that late applicants are more likely to procrastinate than early ones. This approach is widely used in the literature (e.g., De Paola & Scoppa, 2015; Reuben et al., 2015; Himmler et al., 2019).

credit accumulation. In contrast, low procrastinators benefit from improved task quality, as evidenced by GPA improvement.

We examine the mechanisms underlying the intervention's effectiveness in enhancing academic achievement. Our findings indicate that students in the second treatment group report lower procrastination tendencies throughout the semester, with the greatest benefits observed among those with high baseline procrastination. Moreover, high-procrastinators sign up for more credits, a task requiring early-semester action, suggesting improved short-term task initiation. In contrast, the GPA improvements observed among low-procrastinators point to longer-term benefits. This group is more likely to take up the commitment device (20% vs. 15.8%), which promotes consistent planning and reflective practices throughout the semester. This reinforces self-regulatory behaviors, ultimately driving long-term academic improvements.

The remainder of the paper is structured as follows. We begin by reviewing the literature and presenting the conceptual framework and background information of the study. Section II explores procrastination behavior, its impact on study performance, and intervention take-up. Section III outlines the empirical strategy and examines the treatment effects, including ITT and TOT estimates, heterogeneous effects based on procrastination, and underlying mechanisms. Finally, Section V concludes.

### *A. Related Literature*

This study introduces a novel approach by combining schedule assistance with a soft commitment device aimed at reinforcing students' dedication to their learning inputs, a combination not previously explored in the literature. Existing research demonstrates that scheduling tools alone often fail to improve academic outcomes. For instance, Oreopoulos et al. (2019) provided university students with an online planning tool to create semester-long study schedules and sent periodic reminders, yet found no significant effects on grades or credit attainment—a result mirrored in our first treatment group. Similarly, Li et al. (2016) observed that email prompts encouraging students to schedule lecture video viewing in an online course had no impact on performance. Even outside education, Grohmann et al. (2020) reported that offering a savings calendar to small business owners did not increase savings, despite high demand among present-biased individuals. These findings collectively suggest that scheduling interventions, when implemented in isolation, lack the ability to drive behavioral change. Our study addresses this by integrating a commitment device with scheduling support, a combination that proves pivotal in enhancing educational outcomes.

Our intervention's focus on study-time goals further contributes to the goal-setting literature, which debates the efficacy of task-based versus performance-based goals. Clark et al. (2020) found that students who set weekly task-based goals improved their course performance, while end-of-semester grade goals (performance-based) had no effect. Conversely, Lent and Souverijn (2020) demonstrated that performance-based goals set during one-on-one counseling sessions significantly boosted final grades. This discrepancy in the results may stem from differences in the commitment

levels of the students towards their goals: Lent and Souverijn's (2020) mentorship setting likely fostered stronger dedication to goals compared to Clark et al.'s (2020) classroom-based approach. Our findings align with this interpretation, underscoring the importance of embedding commitment mechanisms into goal-setting frameworks.

Finally, our results advance the understanding of "soft" commitment devices in low-touch educational interventions. Commitment strategies have successfully changed behaviors in diverse contexts, such as exercise adherence (Royer et al., 2015), savings (Gugerty, 2007), and smoking cessation (Giné et al., 2010). In education, Himmler et al. (2019) showed that voluntary study-plan commitments increased credit attainment, particularly among procrastinators. Similarly, Felkey et al. (2021) found that microcommitments raised exam grades by 3.5 percentage points in online courses, with stronger effects for procrastinators. Patterson (2018) further demonstrated that commitment devices limiting internet distractions improved study time and grades by 0.29 standard deviations, whereas reminders or blockers alone had no impact. Our study reinforces this pattern: the commitment component of our intervention drives behavioral change more effectively than journaling alone, highlighting its value as a scalable, low-cost tool to enhance academic success.

### *B. Conceptual Framework*

Assisting students to overcome procrastination habits is pivotal for fostering their human capital development, however achieving this cost-effectively is difficult and is often met with limited success (Gallego et al., 2023). Therefore, a thorough understanding of the underlying causes of procrastination is critical for such an endeavor and necessitates targeting multiple contributing factors.

Firstly, procrastination is often linked to a lack of self-regulation, where difficulties in impulse control and delaying gratification contribute to this behavioral tendency. Studies have consistently shown a negative association between low general self-regulation and high levels of procrastination (Wijaya & Tori, 2018). Secondly, ambiguous objectives and poor goal commitment significantly contribute to the likelihood of procrastinatory behaviors (Flett et al., 2012). Lastly, biased decision-making, such as time inconsistency and present bias, leads individuals to delay tasks with distant outcomes (Steel, 2007).

Our full intervention combines a learning journal, commitment device, and reminders to address procrastination from multiple angles. The learning journal enables students to set weekly goals and reflect on the time spent studying, which promotes behaviors like self-assessment, goal setting, and personal planning. Its design follows the principles of MCII (Oettingen & Gollwitzer, 2010), which have proven effective in fostering self-regulation and goal achievement (Duckworth et al., 2013; Kizilcec & Cohen, 2017). Furthermore, Goal setting plays a central role in motivating students, addressing self-control challenges, and reducing present bias (Koch & Nafziger, 2011; Clark et al., 2020).

A proven strategy to combat procrastination and self-regulation failure is the use of commitment devices, which create psychological costs for failing to meet commitments (Himmler et al., 2019; Bryan et al., 2010). It is crucial to ensure that students feel committed to their goals and follow through with their study plans. Therefore, a key component of our intervention is providing a commitment device to reinforce the learning journal and support reflective practices.

The main challenges that face our intervention are take-up and long-term persistence. Although students with self-control issues theoretically seek support[11], the reality is more complex. In our case, 77% of students are first-time university attendees, making them more likely to be unaware of their time-inconsistent tendencies or lacking the experience to recognize the intervention's benefits[12]. Maintaining engagement with the intervention is challenging, as students may lose focus or forget tasks over time (Lei et al., 2011; Ericson, 2017). To address this, we send weekly reminders to prompt students to complete their learning journals, helping refocus attention and keep the intervention salient as they adapt to the academic environment (Guynn et al., 1998; Ericson, 2017).

### *C. Institutional Background*

We conducted our intervention at a large public University of Applied Sciences (UAS) in Germany. The field experiment included the entire cohort of 2,221 incoming first-semester students who enrolled in one of 21 bachelor's programs in the winter semester of 2022-23. The curriculum at UAS is generally more practice-oriented than at traditional, more research-oriented German universities. The study programs at the UAS are structured in accordance with the European Credit Transfer and Accumulation System[13]. A standard bachelor's degree comprises 210 credits, ideally completed within 7 academic semesters. However, the average time to degree is typically around 8.5 semesters. The standard advice according to the study plan is to earn 30 credits per semester, which is equivalent to 15 credits in the U.S. system. The grading system ranges from 1 to 4, with 1 being the highest grade achievable and 4 indicating the lowest passing grade, i.e., the lower the grade the better.

UAS serve a substantial and growing share of the German student population. For instance, in the fall semester of 2020, about 40% of freshman students started studying at a UAS (Statistisches Bundesamt, 2021). Our study features a sample with observable characteristics that are very similar to the general student population in Germany. Approximately 53% of our sample hold a degree from the highest secondary education track—the so-called "Abitur", mirroring the 53.5% among freshmen at all German UAS in 2020[14]. Additionally, the average high school GPA of our sample is 2.56, aligning closely with the 2.41 GPA of all German high school graduates in 2019[15].

[11] For example, several studies have demonstrated the link between commitment contract demand and time-inconsistent behavior (Augenblick et al., 2015; Kaur et al., 2015; Houser et al., 2018).

[12] Previous research, such as Kaur et al. (2015), has shown that take-up of commitment contracts is positively correlated with indicators of time inconsistency, but this effect is more pronounced after repeated exposure to the contracts. This suggests that learning from repeated decision-making plays a critical role in understanding the demand for such interventions.

[13] Europe-wide, universities use a standardized point system (European Credit Transfer and Accumulation System, ECTS), under which a semester consists of 30 credits, with a typical workload of 25-30 hours per credit. (see: https://education.ec.europa.eu/education-levels/higher-education/inclusive-and-connected-higher-education/european-credit-transfer-and-accumulation-system)

[14] See: https://www.datenportal.bmbf.de/portal/en/Tabelle-2.5.106.html#A1

[15] See: https://www.kmk.org/dokumentation-statistik/statistik/schulstatistik/

Higher education, especially in Germany, promotes a significant level of autonomy and independence for its students. German universities traditionally follow a less rigid structure, with fewer enforced deadlines, less feedback through continuous assessments like midterm exams, and more self-directed learning (Bäulke & Dresel, 2023; Stallmann, 2002). This academic freedom and increased responsibility for self-management can pose challenges in time management and contribute to procrastination (Dietz et al., 2007; Hen & Goroshit, 2018; Bäulke & Dresel, 2023). Additionally, since tuition fees at most German universities are heavily subsidized, financial pressures are minimal. This may reduce incentives to maintain a rigorous credit load, potentially exacerbating procrastination, as staying matriculated at a university comes with perks[16].

### *D. Field Experiment*

At the beginning of the semester, students were randomized into two treatment groups and a control group (see Table 1 for an overview of the experimental design). Students in the treatment groups received an unannounced letter that introduced the intervention, while the control group received a placebo welcome letter (see appendix for documof the letters sent). During the semester, the students in both treatment groups received another letter with a reminder of the learning journal (see Figure 1 for an outline of the intervention).

*Treatment 1: learning journal*. Students in the first treatment group were offered access to a semester-long online learning journal. The journal enables students to reflect on their study behavior from the previous week and set goals for the upcoming week, allowing them to compare intended study hours with actual time spent. At the beginning of every week in the semester, the journal encourages students to:

1. Report on their daily study hours from the previous week, with notifications (from the second week onward) comparing actual study time to initial goals.
2. Set study time goals for the upcoming week.
3. Reflect on positive outcomes of achieving their goals, identify obstacles, and develop strategies to overcome them.

This design leverages aspects of MCII interventions, shown to enhance self-regulation, goal commitment, and goal-directed behavior (Duckworth et al., 2013; Kizilcec and Cohen, 2017). Both treatment groups received weekly email reminders to fill out the journal. Examples of the journal and invitation letters are provided in the appendix.

*Treatment 2: learning journal + commitment*. The second treatment group received the same learning journal, with the addition of a soft commitment device. This device allowed students to voluntarily commit to their study time goals through a target agreement. Students were, in a short paragraph, informed of the potential benefits of a commitment device and provided with the opportunity to formally commit by signing their name under a target agreement at the beginning of the learning journal. The agreement specifically commits the students to the study time goals that

[16] Students enjoy certain perks like subsidized housing, healthcare, and transportation, which can incentivize extending their studies.

they set for themselves, while informing them that signing the agreement is voluntary and that failing to meet the goals has no consequences (see appendix). Students who choose to sign the target agreement were reminded of it in the form of a text box at the top of the learning journal.

TABLE 1—EXPERIMENTAL DESIGN

| **T0:** Control | **T1**: Learning Journal | **T2**: Learning Journal + Soft Commitment |
|---|---|---|
| **1. Welcome letter/email incl. information on:**<br><br>i) Typical workload of a full-time study program.<br><br>ii) Announcement of two short online surveys that will be conducted during the semester.<br><br>iii) Second page with information on workload according to ECTS, the competence center, a diversity statement of the university, and advisory services offered by the university.<br><br>**3. Two short surveys on study behavior and well-being**<br><br>**4. Second letter/email incl. information on:**<br><br>i) Upcoming exams<br><br>ii) (Updated) info on points i), ii), and iii) of the welcome letter. | **1. Welcome letter/email incl. information on:**<br><br>i) Typical workload of a full-time study program.<br><br>ii) Announcement of two short online surveys that will be conducted during the semester.<br><br>iii) Second page with information on workload according to ECTS, the competence center, a diversity statement of the university, and advisory services offered by the university.<br><br>iv) Invitation to the online learning journal.<br><br>**2. Online learning journal incl.:**<br><br>i) Weekly reminder email<br><br>**3. Two short surveys on study behavior and well-being**<br><br>**4. Second letter/email incl. information on:**<br><br>i) Upcoming exams<br><br>ii) (Updated) info on points i), ii), and iii) of the welcome letter.<br><br>iii) Learning journal reminder | **1. Welcome letter/email incl. information on:**<br><br>i) Typical workload of a full-time study program.<br><br>ii) Announcement of two short online surveys that will be conducted during the semester.<br><br>iii) Second page with information on workload according to ECTS, the competence center, a diversity statement of the university, and advisory services offered by the university.<br><br>iv) Invitation to the online learning journal.<br><br>**2. Online learning journal incl.:**<br><br>i) Weekly reminder email<br><br>ii) Voluntary target agreement (soft commitment device)<br><br>**3. Two short surveys on study behavior and well-being**<br><br>**4. Second letter/email incl. information on:**<br><br>i) Upcoming exams<br><br>ii) (Updated) info on points i), ii), and iii) of the welcome letter.<br><br>iii) Learning journal reminder |

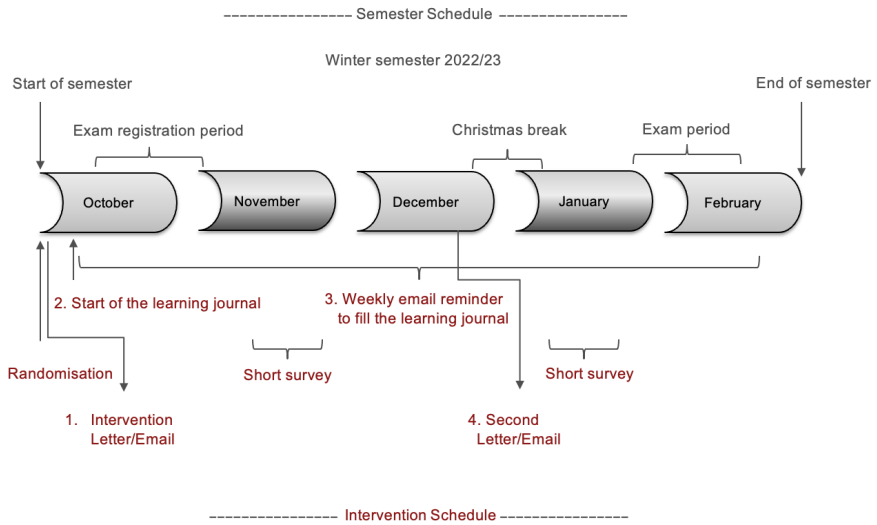


FIGURE 1. TIMELINE OF THE INTERVENTION AND UNIVERSITY SEMESTER

*Notes*: Figure shows the timeline of the intervention and the university semester in the winter term of the year 2022. The experiment began after all COVID-19 pandemic measures were removed. All classes and exams were held face-to-face.

*Randomization.* We randomized all incoming students into three experimental groups. Randomization was carried out using a stratification and balancing procedure, where the strata were constructed based on the study program, a median split of the high school GPA distribution[17], and a median split of students based on their procrastination index. This ensures a balanced treatment assignment across all study programs and important student characteristics. See the appendix for further details on the randomization procedure.

To check whether our randomization procedure successfully balanced observed characteristics across the three experimental groups, we provide estimates of summary statistics in Table 2. Columns 1–3 report the means for each variable across the three groups. Column 4 provides p-Values for a joint orthogonality test. We find no significant differences in any of the students' characteristics. Furthermore, differences are quantitatively very small. At baseline, the average age of our study population was just over 21 years, with a 38% female share. On average, students enroll in university 1.5 years after their high school graduation date, with around 75% of them enrolling for the first time in a higher education institution.

[17] If the study program had small number of students (under 24), we proceed without splitting the sample by high school GPA. See appendix for a detailed description.

TABLE 2—BASELINE CHARACTERISTICS & BALANCING

| | Control | Journal Treatment | Journal + Commitment Treatment | Joint Orthogonality Test (p-value) | N |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| *Socio-economic background* | | | | | |
| 1[Female] | 0.38 | 0.38 | 0.35 | 0.306 | 2221 |
| Age at enrollment (years) | 21.43 | 21.23 | 21.41 | 0.397 | 2221 |
| 1[A-Level] | 0.53 | 0.53 | 0.51 | 0.802 | 2221 |
| 1[schooling outside of Bavaria] | 0.11 | 0.10 | 0.08 | 0.273 | 2221 |
| 1[foreign schooling] | 0.04 | 0.05 | 0.04 | 0.558 | 2221 |
| *Study characteristics* | | | | | |
| Procrastination index (std.) | -0.001 | -0.012 | 0.011 | 0.907 | 2221 |
| Matriculation date (average) | Aug 11, 2022 | Aug 11, 2022 | Aug 10, 2022 | 0.890 | 2221 |
| Application date (average) | Jun 23, 2022 | Jun 23, 2022 | Jun 24, 2022 | 0.644 | 2216 |
| 1[Missing application date imputed] | 0.06 | 0.06 | 0.06 | 0.739 | 2221 |
| High school GPA (German scale: 1 very good - 4 very poor) | 2.47 | 2.47 | 2.49 | 0.785 | 2221 |
| 1[Missing high school GPA imputed] | 0.02 | 0.02 | 0.02 | 0.818 | 2221 |
| 1[first study program] | 0.77 | 0.76 | 0.75 | 0.625 | 2221 |
| Time between school degree and enrollment (years) | 1.68 | 1.56 | 1.62 | 0.624 | 2221 |
| Number of students in each group | 740 | 740 | 741 | | |

*Notes*: Table shows group means of main outcomes at baseline for the control group, and two treatment groups. Final column reports the p-value of an F-test on the treatment arms. Variables in brackets with a leading digit 1 (1[…]) are binary variables. Last row reports the number of students in each group. Small differences in group sizes arise, because randomization was conducted within strata blocks, with some strata blocks having block sizes that were not multiples of three (the number of randomization groups). Stratification variables include Highschool GPA and the procrastination index. Study characteristics of all students were collected before randomization.

### *E. Data Sets*

To evaluate the effects of the intervention, we draw on a rich set of complementary data sources that capture both academic outcomes and underlying behavioral mechanisms. These sources include:

1. **Administrative Data:** University-provided administrative records were used for the randomization process and served as both covariates and outcome variables. This dataset includes students' background information, application dates, and academic performance metrics.
2. **Online Self-Assessments (OSAs):** Mandatory for students in nine study programs, these assessments were conducted prior to the start of the semester. The OSAs gathered information on time preferences, procrastination tendencies, and socio-economic background.
3. **Online Surveys:** Two voluntary online surveys were administered during the semester to collect data on study behavior and non-cognitive outcomes, including stress levels and student satisfaction.
4. **Learning Journal:** The learning journal provided insights into the usage patterns, weekly study hours, and academic goals of the treatment groups. It also measured the take-up rate of a soft commitment intervention for the second treatment group.

### *F. Outcome Variables*

*Study performance measures***.** As preregistered, the study's primary focus includes passed course credits, GPA[18], and student persistence (dropout rate) at the first semester's end. To capture the

[18] GPA is only computed for students who earned credits. Students with zero earned credits do not have a GPA, which explains the lower observation number in respective analysis.

overall academic achievement, an index will be formed using a standardized inverse-covariance weighted average (Schwab et al., 2020).

We use survey data to examine whether the treatment reduced procrastination tendencies post-intervention. Additionally, we assess potential side effects by analyzing its impact on student engagement, measured through credit points registered and attempted, as well as hours dedicated to studying. To ensure a comprehensive assessment, we evaluate the intervention's influence on students' well-being by examining non-cognitive outcomes collected in online surveys. See the appendix for a detailed description of all outcome variables.

## II. Procrastinating Behavior, Study Performance, and Intervention Take-up

### *A. Procrastinating Behavior*

Procrastinators, by definition, are inclined to delay tasks, which includes postponing participation in our treatment program (O'Donoghue & Rabin, 1999). This delay can hinder timely access to the treatment, thereby reducing its potential positive impact on educational outcomes. Therefore, it is important to note that when targeting procrastination, a trade-off characterized by negative selection on gains might arise (Roy, 1951). Paradoxically, while students who procrastinate stand to benefit the most from our intervention, they are also less likely to engage in it. Following the Roy Model, this negative selection on gains introduces a self-selection bias leading to an underestimation of the intervention's efficacy among procrastinators.

From this understanding, we can derive several empirically testable predictions: students with higher procrastination tendencies are likely to have lower academic performance, a lower take-up rate of the intervention, and later engagement with the intervention. No clear prediction can be made regarding the expected treatment effects on educational outcomes among procrastinators. This is because the potentially higher gains for procrastinators from our treatment may be canceled out by lower and later treatment take-up due to procrastination tendencies.

To measure procrastination tendencies, we construct a continuous procrastination index based on students' application and enrollment date, following the approach of De Paola & Scoppa (2015). This method relies on observed choices rather than self-reported data, mitigating concerns of systematic measurement error due to social desirability bias. In the German higher education system, the application period typically runs from early May to mid-July, followed by a registration window from August to the end of September. We define procrastination as the delay in completing these tasks: students who apply and enroll late exhibit higher procrastination tendencies, while those who do so early are considered low procrastinators. This approach assumes that early application reflects prompt task initiation, whereas later application signals procrastination. Thus, our measure captures procrastination on a continuous scale, where longer delays from the start of the application and enrollment period indicate stronger procrastination tendencies. We proceed by investigating the

predictive power of the procrastination measure on educational outcomes and the take-up and usage rate of the intervention.

### *B. Procrastination and Study Performance*

Using our procrastination proxy, we divided our sample at the median value to categorize students into two groups: those with high procrastination tendencies (high-procrastinators) and those with low procrastination tendencies (low-procrastinators). We then compared the academic performance of both groups and present the results in Table 3. Aligning with a meta-analysis of 33 studies by Kim & Seo (2015), which found a negative correlation between procrastination and academic performance, our findings show that high-procrastinators consistently underperform relative to their low-procrastinating peers. On average, low-procrastinators earn 18.3 credits, maintain a GPA of 2.46, and have a 5.4% dropout rate. In contrast, high-procrastinators earn 3.5 fewer credits, have a significantly higher dropout rate (by approximately 8 percentage points), and have a worse GPA by the end of the first semester.

TABLE 3—PREDICTIVE POWER OF PROCRASTINATION ON STUDY OUTCOMES

| | Dropout | Credits | GPA | Index |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| High procrastinators | 0.079*** | -3.594*** | 0.058* | -0.414*** |
| | (0.013) | (0.427) | (0.030) | (0.055) |
| Basel. Controls | Yes | Yes | Yes | Yes |
| Study Program FE | Yes | Yes | Yes | Yes |
| R-squared | 0.05 | 0.32 | 0.31 | 0.11 |
| Observations | 2221 | 2221 | 1708 | 2221 |
| *Outcome descriptives (low procrastinators)* | | | | |
| mean | 0.054 | 18.3 | 2.46 | 0 |
| median | 0 | 20 | 2.47 | 0.19 |
| s.d. | 0.23 | 10.5 | 0.70 | 1 |
| min | 0 | 0 | 1 | -4.24 |
| max | 1 | 50 | 4 | 0.99 |

Notes: Table shows the educational outcomes of high procrastinators relative to low procrastinators. Procrastinators are defined by having been assigned an above median value on the procrastination measure. Ordinary least squares estimates with robust standard errors in parentheses. In Germany, the grading system ranges from 1 to 4, with 1 being the highest grade achievable and 4 indicating the lowest passing grade, i.e., the lower the grade the better. Data set: full population of students of the 2022 cohort. Baseline controls include School GPA, age, time between school graduation and university enrollment, and indicators for being female, having an A-level degree, started the first study attempt, graduated from an out of state school, and graduated abroad. Furthermore, all estimations include study program fixed effects. $*$ $p < 0.10$, $**$ $p < 0.05$, $***$ $p < 0.01$.

### *C. Take-up of the Learning Journal Interventions*

In Table 4, treatment uptake and usage are presented based on treatment assignment and a median split of the procrastination index. Across both treatment groups, approximately 50% of students opened the journal link at least once, with roughly 18% of the second treatment group opting to sign the commitment device. On average, it took students around 2 weeks after the start of the treatment to open the link for the first time. Similarly, usage, measured by time spent on the journal screen,

was comparable between groups, averaging around 4 minutes[19]. We believe that this relatively low usage intensity may stem from students opting for more convenient alternatives to track their study times. The online journaling process may not be as practical as traditional methods like pen and paper or specialized apps. Anecdotal evidence and survey data collected a year after the intervention suggest that treated students, particularly those in the second treatment group, often adopted journaling and goal-setting on paper, finding it faster and more convenient.

Examining uptake and usage through the lens of procrastination tendencies reveals noticeable differences. As anticipated, students exhibiting higher levels of procrastination tendencies demonstrate lower uptake and usage intensity compared to low-procrastinators. For instance, while approximately 53.5% of low-procrastinators in both treatment groups accessed the journal link at least once, only 45% of high-procrastinators did so. Similarly, high-procrastinators spent less time on the journal online, and it took them, on average, four more days to engage with the treatment.

TABLE 4—TREATMENT TAKE-UP AND USAGE

| | Journal Treatment | Journal + Commitment Treatment | Difference (2 vs. 1) | Low Procrastinators | High Procrastinators | Difference (5 vs. 4) |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Open Journal Link | 0.493 | 0.495 | 0.002 | 0.535 | 0.452 | -0.083*** |
| | (0.500) | (0.500) | (0.938) | (0.499) | (0.498) | (0.001) |
| Time Elapsed till Take Up (days) | 14.811 | 16.120 | 1.309 | 13.552 | 17.814 | 4.262** |
| | (22.336) | (24.241) | (0.448) | (20.264) | (26.402) | (0.016) |
| | N=365 | N=367 | | | | |
| Average Time Spent on Journal (minutes) | 4.367 | 4.430 | 0.063 | 5.196 | 3.402 | -1.795** |
| | (11.551) | (9.317) | (0.938) | (11.718) | (8.580) | (0.020) |
| | N=365 | N=367 | | | | |
| Sign Commitment | | 0.179 | | 0.200 | 0.158 | -0.042 |
| | | (0.384) | | (0.401) | (0.366) | (0.141) |
| Observations (total number in each group) | 740 | 741 | | 753 | 728 | |

Notes: Table columns 1 and 2 present the take-up rate and average usage of the treatment split by treatment groups, while columns 4 and 5 presents the take-up rate and average usage of the treatment split by procrastination tendencies of all students assigned to the treatment groups. High procrastinators are defined by having been assigned an above-median value on the procrastination measure, while low procrastinators have been assigned a below-median value. ∗ $p < 0.10$, ∗∗ $p < 0.05$, ∗∗∗ $p < 0.01$. Robust standard errors in parentheses

## III. Treatment Effects

### *A. Empirical Strategy*

This section describes the estimand of the treatment effect and the empirical model that we estimate with our data. Randomization of treatment assignment identifies our empirical model. The treatment indicators $T_{1,i}$ and $T_{2,i}$ are equal to 1 if participation is offered either for the learning journal ($T_{1,i}$) or the learning journal with commitment ( $T_{2,i}$) and 0 otherwise. The coefficients $\alpha_1$ and $\alpha_2$ in Equation (1) provide the estimates for the ITT effects for both treatment arms. We estimate Equation (1) using a linear ordinary least squares regression and report robust standard errors for the estimates.

[19] See appendix for a detailed graphical illustration of average weekly usage split by treatment groups and procrastination tendencies.

(1) $$y_{ij}^{k} = \alpha_0 + \alpha_1 T_{1,i} + \alpha_2 T_{2,i} + \boldsymbol{x_i \beta} + \boldsymbol{s_j} + \varepsilon_{ij},$$

We use demographic information and pre-treatment outcomes as covariates in our estimations to increase their precision. The vector $\boldsymbol{x_i}$ subsumes pre-specified control variables, which include: a procrastination index, school GPA, age, time between school graduation and university enrolment, and indicators for being female, having an A-level degree, first-time university student, graduated from an out of state school, graduated abroad. Furthermore, a stratified randomization mechanism is employed, we use fixed effects $\boldsymbol{s_j}$ to control for the strata in which each student was randomized into one of the treatment arms, as recommended by Bruhn and McKenzie (2009). The error term is denoted by $\varepsilon_{ij}$.

While the ITT effects capture the impact of offering the journals, including those who never engaged with the treatment, we estimate the TOT to determine the impact among students who actually accessed the learning journal website at least once. For that, we utilize 2SLS to estimate the TOT. Since the control group did not have access to the treatment, the TOT can be calculated as the local average treatment effect by using randomized assignment to the treatment groups as an instrumental variable. We define program take-up as a student who opened the intervention link at least once and thus had engaged with our treatment. The following estimates the TOT:

*(2)* $$T_{1}\_takeup_{ij} = \alpha_{10} + \alpha_{11} T_{1,i} + \alpha_{12} T_{2,i} + \boldsymbol{x_i \alpha_{12}} + \boldsymbol{s_{1j}} + \varepsilon_{1ij}$$

(3) $$T_{2}\_takeup_{ij} = \alpha_{10} + \alpha_{12} T_{1,i} + \alpha_{22} T_{2,i} + \boldsymbol{x_i \alpha_{22}} + \boldsymbol{s_{2j}} + \varepsilon_{2ij}$$

(4) $$y_{ij}^{k} = \gamma_0 + \gamma_1 T_{1}\_\widehat{takeup}_{ij} + \gamma_2 T_{2}\_\widehat{takeup}_{ij} + \boldsymbol{x_i \gamma_2} + \boldsymbol{s_{3j}} + \epsilon_{ij}.$$

The treatment offer was randomized at the individual level, and the invitation letters were sent directly to students and were not discussed within classrooms at the university. Hence, spillover effects on students in the control group are unlikely, supporting the stable unit treatment assumption.

In studying the effects of journaling goals and study time with mental contrasting on education, we expect these effects to vary among students based on their procrastination tendencies. To capture these differences, we conducted a regression analysis focusing on heterogeneous effects for students with high procrastination tendencies. We introduce an interaction term between our treatment and being a procrastinator and estimate the following equation:

(5) $$y_{ij}^{k} = \alpha_0 + \alpha_1 T_{1,i} + \alpha_2 T_{2,i} + \alpha_3 T_{1,i} * Proc. + \alpha_4 T_{2,i} * Proc. + \alpha_5 Proc. + \boldsymbol{x_i \beta} + \boldsymbol{s_j} + \varepsilon_{ij},$$

where $Proc.$ is an indicator that a student is a procrastinator. Specifically, it is equal to 1 if the student has been assigned an above median value on their procrastination measure and 0 otherwise. We again control and include the same specification as in Equation (1).

*B. Intention-to-Treat (ITT) Effects*

We begin by presenting the intention to treat effects on academic achievement outcomes at the end of the first academic semester. Table 5 shows the effect of being assigned to one of the treatment groups on dropout rate, credits earned, GPA, and an index of all outcomes combined. The

estimations provided include a set of baseline controls and control for the method of randomization. On average, students in the control group earned 15.2 credit points, had a GPA of 2.57, and a dropout rate of 10 percent. We find that offering the journal with a commitment device significantly increases the number of credit points earned and significantly improves GPA at the end of the first semester. Whereas offering the learning journal on its own does not yield any significant effects.

On average, the second (commitment) treatment group earned 0.85 more credit points than the control group amounting to a standardized effect size of 0.075 SD (*p*: 0.08). Additionally, the second treatment group achieved a higher GPA of 0.086 points (0.124 SD; *p*: 0.012) at the end of the first semester. This eliminates any concerns about any substitution effects occurring, i.e., earning more credits at the cost of their average grade or vice versa. Examining the constructed index in column 4, we find some improvement for the second treatment group, although it is not statistically significant. This is primarily because that index places a large weight on the dropout outcome, which is unaffected by the treatment (Schwab et al., 2020). However, when constructing an alternative index that assigns equal weight to the three outcome variables (credits, GPA, and dropout), we find a significant improvement of 0.114 SD (*p*: 0.048) for the commitment treatment group.

TABLE 5—ITT EFFECTS ON STUDY PERFORMANCE

| *Dep. Var.:* | Dropout | Credits | GPA | Index |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Journal treatment | 0.002 | 0.265 | 0.022 | -0.002 |
| | (0.015) | (0.479) | (0.035) | (0.050) |
| Journ. & commitment treatment | -0.012 | 0.848* | -0.086** | 0.065 |
| | (0.015) | (0.490) | (0.034) | (0.048) |
| Basel. Controls | Yes | Yes | Yes | Yes |
| Strata FE | Yes | Yes | Yes | Yes |
| R-squared | 0.12 | 0.38 | 0.38 | 0.16 |
| Observations | 2221 | 2221 | 1708 | 2221 |
| *Outcome descriptives (control group)* | | | | |
| mean | 0.10 | 15.2 | 2.57 | 0 |
| median | 0 | 16 | 2.59 | 0.25 |
| s.d. | 0.30 | 11.2 | 0.69 | 1 |
| min | 0 | 0 | 1 | -3.01 |
| max | 1 | 45 | 4 | 0.85 |
| *(Joint) significant tests (p-values)* | | | | |
| $H_0$: J = J&C = 0 | 0.579 | 0.208 | 0.003 | 0.285 |
| $H_0$: J = J&C | 0.340 | 0.223 | 0.001 | 0.170 |

*Notes*: Table shows intention-to-treat (ITT) effects on dropout rate, credit points earned, average grade point and an index of the three outcomes at the end of the first academic semester. 'Journal treatment 'denotes random assignment to the first treatment group. 'Journ. & commitment treatment' denotes random assignment to the second treatment group. Ordinary least squares estimates with robust standard errors in parentheses. In Germany, the grading system ranges from 1 to 4, with 1 being the highest grade achievable and 4 indicating the lowest passing grade, i.e., the lower the grade the better. Data set: full population of students of the 2022 cohort. Baseline controls include Procrastination Index, School GPA, age, time between school graduation and university enrollment, and indicators for being female, having an A-level degree, started the first study attempt, graduated from an out of state school, graduated abroad. Furthermore, all estimations include strata fixed effects. $*$ $p < 0.10$, $**$ $p < 0.05$, $***$ $p < 0.01$.

The null effects in the first treatment group align with prior findings that standalone scheduling or goal-setting tools—absent commitment mechanisms—fail to improve academic outcomes (Oreopoulos et al., 2019; Dobronyi et al., 2019; van Lent, 2019). Our results, thus, highlight the critical role of commitment devices in translating goal-setting intentions into measurable behavioral change. By imposing psychological costs for non-compliance, the commitment device counteracts present bias and strengthens adherence to self-regulatory practices established through the learning journal. These findings suggest that scalable interventions targeting procrastination must integrate accountability mechanisms to achieve meaningful impact.

### *C. TOT Effects*

Not all students assigned to the treatment actively engaged with it, which may cause differences between the ITT estimates and the actual effects of treatment engagement. To assess treatment efficacy—that is, the impact of active engagement on educational outcomes—we employ a two-

stage least squares (2SLS) approach using random assignment as an instrument, as outlined in Equation (4).

In our analysis, a student is considered treated if they opened the intervention link at least once during the first semester[20]. Panel B at the bottom of Table 6 presents the first-stage estimates from Equations (2) and (3), indicating compliance rates of 49.3% for treatment group 1 and 49.6% for treatment group 2. Compared to non-compliers, compliers exhibit lower procrastination tendencies, slightly better high school GPA, and a greater likelihood of being first-time university enrollees, while their socio-economic backgrounds remain similar (see appendix). The first-stage estimates are robust, with an F-statistic exceeding 500, confirming that treatment assignment provides strong exogenous variation in take-up.

Table 6 presents the TOT effects on various study performance outcomes. In general, the TOT effects among the second treatment group are larger in magnitude than the ITT effects. Treated students in the second treatment arm earned 1.7 more credits (effect size: 0.15 SD; $p$: 0.07) compared to control group members who would have taken up the treatment if offered. Additionally, treated students in this group achieved a better GPA of 0.157 points (effect size: 0.22 SD; $p < 0.01$) relative to the control group. While, as expected, we find no significant treatment effects in the first treatment group.

Compared to the ITT effects, we find taking up the journal and commitment treatment increases effects on earned credit points from 0.85 to 1.7 credit points (.075 to .15 SD) and GPA improvement from 0.086 points to 0.157 points (.12 to .22 SD). According to the benchmark for effect sizes in education, proposed by Kraft (2020), both the ITT and TOT estimates indicate a medium effect size[21]. Typically, one course accounts to 5 credit points, thus, our treatment effect could be interpreted as roughly one in four students completing an additional course per semester. Overall, we find significant improvements in the academic achievements of the second treatment group on various objective measures and proceed to investigate whether the treatment affects procrastinators and non-procrastinators differently.

[20] We also redefined compliance for the second treatment group as signing the commitment device. When considering these students as compilers, we find robust TOT effects.

[21] Kraft (2020) proposes the following classification of effect sizes: < .05: small, .05 − 0.2: medium, and ≥ 0.2: large.

TABLE 6—TOT EFFECTS ON STUDY PERFORMANCE

| *Dep. Var.:* | Dropout | Credits | GPA | Index |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Journal treatment | 0.004 | 0.541 | 0.042 | -0.004 |
| | (0.030) | (0.934) | (0.063) | (0.098) |
| Journ. & commitment treatment | -0.024 | 1.707* | -0.157*** | 0.131 |
| | (0.029) | (0.945) | (0.059) | (0.093) |
| Basel. Controls | Yes | Yes | Yes | Yes |
| Strata FE | Yes | Yes | Yes | Yes |
| R-squared | 0.12 | 0.39 | 0.38 | 0.16 |
| Observations | 2221 | 2221 | 1708 | 2221 |
| *Outcome descriptives (control group)* | | | | |
| mean | 0.10 | 15.2 | 2.57 | 0 |
| median | 0 | 16 | 2.59 | 0.25 |
| s.d. | 0.30 | 11.2 | 0.69 | 1 |
| min | 0 | 0 | 1 | -3.01 |
| max | 1 | 45 | 4 | 0.85 |
| *First Stage Dep. Var.: Open Treatment Link [(B)]* | | | | |
| Journal treatment | 0.493*** | 0.493*** | 0.493*** | 0.493*** |
| | (0.017) | (0.017) | (0.017) | (0.017) |
| Journ. & commitment treatment | 0.496*** | 0.496*** | 0.496*** | 0.496*** |
| | (0.018) | (0.018) | (0.018) | (0.018) |
| 1st Stage F-Statistic | 669.6 | 669.6 | 587 | 669.6 |

*Notes*: Table shows the treatment on the treated effects (TOT) effects on dropout rate, credit points earned, average grade point and an index of the three outcomes at the end of the first academic semester. IV estimates using 2SLS are presented. The endogenous variable is an indicator variable for whether a student opened the intervention link. The instruments are indicator variables for the random assignment to the treatment groups. 'Journal treatment' denotes random assignment to the first treatment group. 'Journ. & commitment treatment' denotes random assignment to the second treatment group. All specifications are identical to Table 5. Panel B at the bottom of the table presents the first stage estimates and first stage F-Statistic. * p < 0.10, ** p < 0.05, *** p < 0.01.

### *D. Heterogeneous Treatment Effect Based on Procrastinating Behavior*

Our intervention combines goal setting, mental contrasting, reminders, and commitment to address self-regulation issues by fostering goal commitment and facilitating action plans. Investigating its effects on students with high procrastination tendencies is particularly interesting, as they often struggle with low self-regulation and present bias, thus potentially experiencing significant improvements in their self-regulatory skills. However, even students with low procrastination tendencies could benefit from our intervention, as it fosters planning and mental reflection, which can enhance academic achievement. To investigate the treatment effect for these two subgroups, we add an interaction term of being a high or low procrastinator to Equation (1).

Table 7 shows the interaction of the treatment effect with a median split of our procrastination index. The presented estimates control for baseline characteristics and include strata-fixed effects.

In general, high-procrastinators perform worse than low-procrastinators in all achievement outcomes. More interestingly, we find heterogeneous treatment effects based on whether a person is a high- or low-procrastinator. Looking at the marginal effects, presented at the bottom of Table 7, we find procrastinators in the second treatment group earn 1.36 more credit points than procrastinators in the control group ($p$: 0.06). Conversely, among students with low procrastination tendencies, the treatment results in a significant improvement of their GPA by 0.157 points ($p < 0.01$) and a reduction in dropout rates by 3 percentage points ($p$: 0.07). We also analyzed the heterogeneity of TOT effects on educational outcomes based on procrastination tendencies and reported these results in the appendix.

Offering the learning journal coupled with a commitment device appears to yield distinct benefits for both procrastinators and non-procrastinators. Among low-procrastinators, our results suggest that the intervention enhances task quality, as evidenced by GPA improvement. Low procrastinators have more of a long-term effect since GPA reflects long-lasting effort. This could be due to two things, mainly that low-procrastinators are more likely to take up the commitment device, in turn this increases consistency, through that these students also benefit from long-term use and reflective practices which could improve their effective learning time. This enhancement could be attributed in part to the intervention's mental contrasting component, which fosters self-reflection, leading to improvements in the learning process. The lack of impact on credit accumulation for non-procrastinators may result from a ceiling effect, where further credit gains are harder to achieve after a certain point, shifting gains toward qualitative improvements like better grades. Conversely, the significantly higher number of credits earned by procrastinators indicates that the treatment aids procrastinators in initiating tasks and mitigating their tendency to postpone credit acquisition until later stages of their degree. This effect is mainly driven by short-term effects in task initiation, especially at the beginning of the semester when students register for their courses. Procrastinators seem to register themselves for more credits and in turn more credits earned (see Table 9).

TABLE 7—ITT EFFECTS ON STUDY PERFORMANCE BY PROCRASTINATION

| *Dep. Var.:* | Dropout | Credits | GPA | Index |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Journal treatment | -0.016 | 0.918 | 0.001 | 0.057 |
| | (0.018) | (0.662) | (0.048) | (0.059) |
| Journ. & commitment treatment | -0.030* | 0.280 | -0.157*** | 0.127** |
| | (0.017) | (0.671) | (0.046) | (0.055) |
| 1[Above median procrastination] | 0.102*** | -3.054*** | -0.092 | -0.338*** |
| | (0.039) | (1.168) | (0.090) | (0.128) |
| J Treatm. x 1[Procr. > median] | 0.031 | -1.172 | 0.050 | -0.103 |
| | (0.031) | (0.968) | (0.072) | (0.101) |
| J&C Treatm. x 1[Procr. > median] | 0.039 | 1.081 | 0.164** | -0.136 |
| | (0.030) | (0.991) | (0.069) | (0.098) |
| Basel. Controls | Yes | Yes | Yes | Yes |
| Strata FE | Yes | Yes | Yes | Yes |
| R-squared | 0.12 | 0.38 | 0.38 | 0.16 |
| Observations | 2221 | 2221 | 1708 | 2221 |
| *Journal treatment effect for:* | | | | |
| low procrastination students | -0.016 | 0.918 | 0.001 | 0.057 |
| | (0.018) | (0.662) | (0.048) | (0.059) |
| high procrastination students | 0.016 | -0.254 | 0.050 | -0.046 |
| | (0.025) | (0.699) | (0.053) | (0.082) |
| *Journ. & commitment treatment effect for:* | | | | |
| low procrastination students | -0.030* | 0.280 | -0.157*** | 0.127** |
| | (0.017) | (0.671) | (0.046) | (0.055) |
| high procrastination students | 0.009 | 1.360* | 0.007 | -0.009 |
| | (0.025) | (0.723) | (0.051) | (0.081) |

*Notes*: Table shows intention-to-treat (ITT) effects on dropout rate, credit points earned, average grade point and an index of the three outcomes at the end of the first academic semester. All estimates include an interaction between treatment assignment and whether a student is a procrastinator. 'Journal treatment 'denotes random assignment to the first treatment group. 'Journ. & commitment treatment' denotes random assignment to the second treatment group. Ordinary least squares estimates with robust standard errors in parentheses. High procrastinators are defined by having been assigned an above-median value on the procrastination measure, while low procrastinators have been assigned a below-median value. In Germany, the grading system ranges from 1 to 4, with 1 being the highest grade achievable and 4 indicating the lowest passing grade, i.e., the lower the grade the better. Data set: full population of students of the 2022 cohort. Baseline controls include Procrastination Index, School GPA, age, time between school graduation and university enrollment, and indicators for being female, having an A-level degree, started the first study attempt, graduated from an out of state school, graduated abroad. Furthermore, all estimations include strata fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

### *E. Analysis of Mechanisms*

This section examines the mechanisms behind the observed improvements in academic achievement following the introduction of the learning journal paired with a commitment device. Using survey data and inputs from the online learning journal, we assess whether changes in post-intervention procrastination tendencies and study time explain the improvements in educational outcomes.

To ascertain that the responders of the short surveys have balanced observable characteristics across experimental groups, we provide estimates of their summary statistics in Table 8. We find that survey responders across all experimental groups have balanced background variables, which

do not differ from each other significantly. However, the control group exhibited a higher response rate (almost double), potentially due to treatment group students mistaking survey invitations with weekly reminders. Therefore, although socio-economic and academic backgrounds are balanced, differences in unobservable traits like motivation may persist. To address this, we focus on comparisons between the two treatment groups, which exhibit very similar response rates and background characteristics, mitigating concerns about selection bias.

TABLE 8—SURVEY RESPONDER CHARACTERISTICS & BALANCING

| | Control | Journal Treatment | Journal + Commitment Treatment | Joint Orthogonality Test (p-value) |
|---|---|---|---|---|
| *Socio-economic background* | | | | |
| 1[Female] | 0.44 | 0.41 | 0.47 | 0.678 |
| Age at enrollment (years) | 21.31 | 20.77 | 20.96 | 0.224 |
| 1[A-Level] | 0.54 | 0.52 | 0.67 | 0.094 |
| 1[schooling outside of Bavaria] | 0.13 | 0.06 | 0.12 | 0.148 |
| 1[foreign schooling] | 0.02 | 0.03 | 0.05 | 0.495 |
| *Study characteristics* | | | | |
| Procrastination index (std.) | -0.184 | -0.117 | -0.123 | 0.793 |
| Matriculation date (average) | Aug 09, 2022 | Aug 10, 2022 | Aug 07, 2022 | 0.444 |
| Application date (average) | Jun 18, 2022 | Jun 17, 2022 | Jun 21, 2022 | 0.665 |
| 1[Missing application date imputed] | 0.01 | 0.06 | 0.04 | 0.088 |
| High school GPA (German scale: 1 very good - 4 very poor) | 2.29 | 2.26 | 2.25 | 0.849 |
| 1[Missing high school GPA imputed] | 0.02 | 0.01 | 0.03 | 0.795 |
| 1[first study program] | 0.82 | 0.79 | 0.82 | 0.780 |
| Time between school degree and enrollment (years) | 1.55 | 1.43 | 1.30 | 0.500 |
| Observation per group | 215 | 116 | 97 | |

*Notes*: Table shows the survey responders means of main outcomes at baseline for the control group, and two treatment groups. Final column reports the p-value of an F-test on the treatment arms not predicting the respective baseline outcome or any of the further variables. Variables in brackets with a leading digit 1 (1[…]) are binary variables. Last row reports the number of students in each group. Small differences in group sizes arise, because randomization was conducted within strata blocks, with some strata blocks having block sizes that were not multiples of four (the number of randomization groups).

Using two surveys at the beginning and end of the semester, we measure procrastination tendencies using an 11-point Likert scale (0 = no tendency to delay, 10 = strong tendency). Columns 1 and 2 of Table 9 illustrate the effect of incorporating a commitment device into the learning journal on post-intervention procrastination tendencies. We observe a significant reduction in procrastination tendencies, with the most pronounced effects emerging from the first survey conducted around the course sign-up period (effect size: 0.33 SD, $p < 0.05$). Another potential factor contributing to improved academic performance is the efficiency of study time rather than merely the total hours invested. Utilizing self-reported study hours from brief surveys and learning journal entries, we find no substantial evidence that the commitment group spent significantly more time studying. However, students in this group may have demonstrated higher effective learning time, likely due to decreased procrastination, allowing them to extract more value from the same study hours compared to the other experimental group.

Panel B of Table 9 examines the marginal effects based on baseline procrastination tendencies to assess potential heterogeneity in treatment effects. The results indicate that students with initially

high procrastination levels experienced the greatest reduction, aligning with the intervention's goal of mitigating present bias. Compared to the first treatment group, high-procrastinators in the commitment treatment group sign up for 1.7 more credits ($p < 0.05$)[22]. This, in turn, contributes to higher credit earned over the semester, highlighting the potential of the treatment to increase task initiation among procrastinators.

The intervention's impact varies significantly between high- and low-procrastinators, reflecting distinct behavioral mechanisms. Low-procrastinators are more likely to take up the commitment device (20% vs. 15.8%), possibly encouraging consistent planning and reflective practices. This sustained engagement translates into long-term academic improvements, particularly in GPA, suggesting that the intervention strengthens their existing self-regulatory behaviors. In contrast, high-procrastinators benefit primarily in the short term, with a notable increase in early-semester course sign-up. This increase in task initiation (credit sign-up) leads to higher credit accumulation by the semester's end (Behlen et al., 2023). Collectively, the evidence points to the intervention's capacity to both strengthen established self-regulatory behaviors and overcome procrastination-induced delays, making it well-suited for diverse student populations.

TABLE 9—ITT EFFECTS ON PROCRASTINATION PROXY, CP SIGN-UP, AND STUDY TIME

| *Dep. Var.:* | Procrastination S1 | Procrastination S2 | CP Sign-up | Study time |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Journ. & commitment treatment | -0.926** | -0.484 | 0.780 | 2.246 |
| | (0.452) | (0.718) | (0.494) | (1.726) |
| Basel. Controls | Yes | Yes | Yes | Yes |
| Study Program FE | Yes | Yes | Yes | Yes |
| R-squared | 0.30 | 0.42 | 0.25 | 0.11 |
| Observations | 179 | 92 | 1477 | 322 |
| Mean in journal treatment group | 5.85 *(sd.:2.8)* | 5.90 *(sd.:3.0)* | 24.5 *(sd.:11.2)* | 24.6 *(sd.:12.5)* |
| *Marginal Effects by Baseline Procrastination Tendencies [(B)]* | | | | |
| T2: Low-procrastinator | -0.309 | 0.183 | -0.229 | 1.976 |
| | (0.608) | (1.074) | (0.599) | (1.986) |
| T2: High-procrastinator | -1.456** | -1.621* | 1.763** | 2.516 |
| | (0.662) | (0.970) | (0.803) | (2.793) |

*Notes*: 'Journ. & commitment treatment' denotes random assignment to the second treatment group. The comparison group is the first treatment group. Column 1 and 2 shows intention-to-treat (ITT) effects of being assigned to the journal and commitment group on self-reported post-intervention procrastination tendencies, in terms of postponing learning activities, from the first and second survey respectively. "CP Sign-up" refers to the number of credit points signed up for by students approximately a month after the beginning of the semester. Column 4 shows the average self-reported study time per week as pooled from the learning journal and 2 surveys. Panel B at the bottom half of the table reports the respective marginal effects based on baseline procrastination tendencies. Ordinary least squares estimates with robust standard errors in parentheses. We use study program fixed effects instead of strata fixed effects to avoid inflated measurements from small strata sample sizes. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

[22] Credit sign-up refers to students registering online for a course, specifically during the signup window in the beginning of the semester. They can also deregister from a course during the semester. If they decide to stay registered and take the exam, this will count as attempted credits. To earn the credits, students must pass the exam requirements.

### *F. Side Effects of the Intervention*

Possible side effects of the treatment might influence student well-being positively or negatively. On one hand, the treatment could decrease well-being by increasing perceived performance pressure. On the other hand, it might alleviate stress by reducing procrastination, thereby improving well-being. We used two post-intervention surveys to investigate any treatment side effects on various well-being outcomes and reported the pooled results in Table 10. Overall, we find no significant differences in well-being indicators like life satisfaction, pressure, and stress. This suggests that the commitment treatment has a net positive effect on the number of credits earned and the average grade in the first academic semester.

Finally, we examine how the treatment influences student engagement throughout the semester, measured by the number of credits signed up for and actively attempted, as higher enrollment and participation indicate greater engagement. However, we find no significant differences between the control and treatment groups across engagement proxies (see Appendix for further details). There are some indications that students in the second treatment group sign up for and attempt more credits, though this effect is not statistically significant across the general sample.

TABLE 10—EFFECTS ON WELL-BEING OUTCOMES

| | Satisfaction | Pressure | Stress | Well-being index |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Journal treatment | -0.060 | -0.279 | -0.163 | -0.063 |
| | (0.109) | (0.185) | (0.174) | (0.119) |
| Journ. & commitment treatment | 0.146 | 0.134 | -0.248 | 0.126 |
| | (0.102) | (0.197) | (0.189) | (0.119) |
| Basel. Controls | Yes | Yes | Yes | Yes |
| Study program FE | Yes | Yes | Yes | Yes |
| r2 | 0.18 | 0.16 | 0.15 | 0.05 |
| Observations | 425 | 407 | 409 | 426 |
| *Outcome descriptive (control group)* | | | | |
| mean | -0.024 | 4.21 | 4.66 | 0 |
| median | 0.071 | 4 | 5 | 0.072 |
| s.d. | 0.94 | 1.51 | 1.40 | 1 |
| min | -3.39 | 1 | 1 | -4.56 |
| max | 1.98 | 7 | 7 | 2.34 |
| *(Joint) significant tests (p-values)* | | | | |
| $H_0$ : J = J&C = 0 | 0.145 | 0.149 | 0.367 | 0.319 |
| $H_0$: J = J&C | 0.062 | 0.063 | 0.687 | 0.139 |

*Notes*: Table shows intention-to-treat (ITT) effects on well-being outcomes. 'Journal treatment 'denotes random assignment to the first treatment group. 'Journ. & commitment treatment' denotes random assignment to the second treatment group. Ordinary least squares estimates with robust standard errors in parentheses. All dependent variables are constructed based on a combination of student responses in 2 surveys throughout the semester. Baseline controls include Procrastination Index, School GPA, age, time between school graduation and university enrollment, and indicators for being female, having an A-level degree, started the first study attempt, graduated from an out of state school, graduated abroad. All estimations include study program fixed effects. $*$ $p < 0.10$, $**$ $p < 0.05$, $***$ $p < 0.01$.

## IV. Conclusion

Procrastination is a common issue affecting many areas of life. Thus, interventions must be non-intrusive and cost-effective to be widely implementable. We designed and tested a cost-effective, easily scalable intervention aimed at improving educational outcomes by increasing self-regulation and reducing procrastination among higher education students. Specifically, we offered students the chance to fill out a weekly learning journal and, in an additional treatment group, provided a complimentary soft commitment device.

Our field experiment results show significant improvements in educational outcomes when students were offered a learning journal with a soft commitment device. These students earned more credits in their first semester and maintained higher GPA than the control group. These improvements came with no adverse effects on any measured well-being indicators. The intervention benefited both high- and low-procrastinators, making it useful for a wide range of individuals.

The observed improvement in student outcomes, though modest in magnitude, demonstrates a high benefit-to-cost ratio given the minimal resources required for implementation. Its affordability and scalability make it policy-relevant, offering an effective and accessible strategy for promoting academic success. Universities could incorporate such supportive measures into orientation programs to assist first-year students in navigating the transition to higher education, providing early support for time management and reducing procrastination.

The results of this study highlight the critical role of the commitment device in enhancing the effectiveness of the intervention. The commitment device fostered stronger adherence to study plans and more consistent effort by increasing the psychological costs of failing to meet self-set goals. This reveals the importance of integrating commitment devices into such low-touch interventions to maximize their potential impact on behavioral outcomes.

A key limitation of our study is the inability to track whether students continued journaling outside the online portal, making it challenging to assess engagement levels accurately. Future research could address this by incorporating paper-based learning journals, which may be more accessible and encourage sustained use. Additionally, refining the journal's design to enhance user experience and ease of access could improve engagement. Finally, increasing the take-up rate of the commitment device remains an important avenue for exploration, as higher adoption could amplify its impact on academic performance.

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Kim, K. R., & Seo, E. H. (2015). The relationship between procrastination and academic performance: A meta-analysis. Personality and individual differences, 82, 26-33.

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# Appendix

## *A. Descriptive Analysis of Journal Usage*

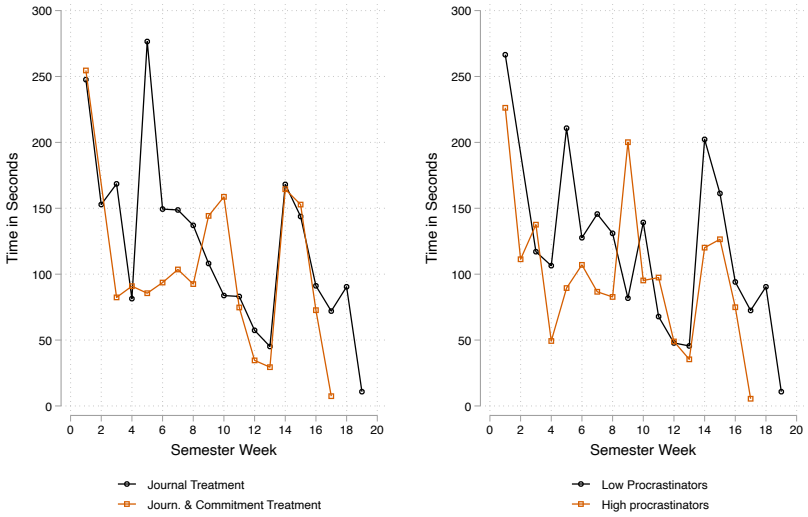



FIGURE A1. AVERAGE WEEKLY USAGE OF LEARN JOURNAL

*Notes*: Figure shows the average screen time recorded per week in seconds. The left-side figure compares average usage of the two treatment groups. The figure on the right-side presents weekly usage of the learning journal separated by procrastination tendencies. Weeks 12 and 13 are the end of the year holidays. The graphs were restricted to the 95$^{th}$ percentile to limit the effect of outliers on the distribution. Outliers in the time spent on the journal could occurs if a student forgets to close the journal webpage for prolonged time.

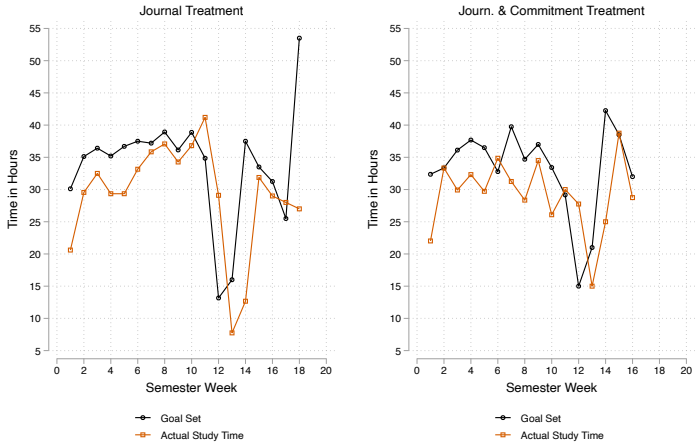
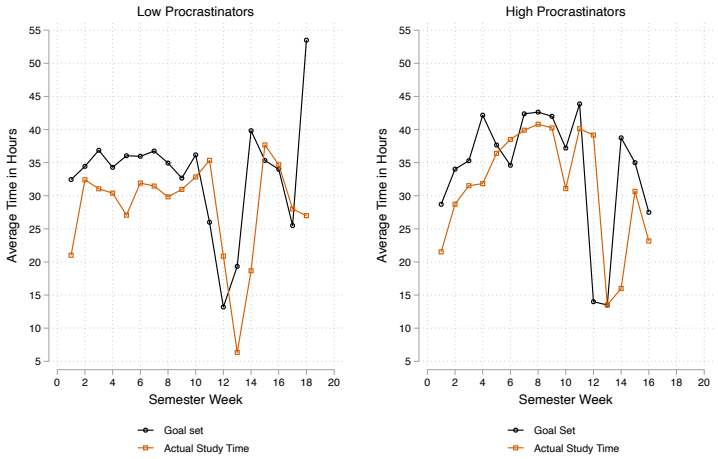



FIGURE A2. AVERAGE WEEKLY INPUTS IN THE LEARNING JOURNAL BY TREATMENT GROUP

*Notes*: The figure shows the average goal set and actual study time per week in hours as imputed in the learning journal. The left-side figure presents the weekly average goals and study time in the first treatment group. The figure on the right side presents the weekly average goals and study time in the second treatment group. Weeks 12 and 13 are the end-of-year holidays.




FIGUREA3. AVERAGE WEEKLY INPUTS IN THE LEARNING JOURNAL BY PROCRASTINATION TENDENCIES

*Notes*: The figure shows the average goal set and actual study time per week in hours as imputed in the learning journal. The left-side figure presents the weekly average goals and study time for low procrastinators. The figure on the right side presents the weekly average goals and study time for high procrastinators. Weeks 12 and 13 are the end-of-year holidays.

## *B. TOT EFFECTS*

TABLE A3—BALANCING TABLE FOR COMPLIERS AND NON-COMPLIERS (T1 & T2 COMPLIER= OPEN LINK)

| | Non-Compliers | Compliers Journal Treatment | Compliers Commitment Treatment | Joint Orthogonality Test (p-value) | N |
|---|---|---|---|---|---|
| *Socio-economic background* | | | | | |
| 1[Female] | 0.35 | 0.41 | 0.38 | 0.152 | 2221 |
| Age at enrollment (years) | 21.44 | 21.10 | 21.23 | 0.116 | 2221 |
| 1[A-Level] | 0.51 | 0.52 | 0.55 | 0.336 | 2221 |
| 1[schooling outside of Bavaria] | 0.09 | 0.10 | 0.09 | 0.856 | 2221 |
| 1[foreign schooling] | 0.03 | 0.04 | 0.04 | 0.414 | 2221 |
| *Study characteristics* | | | | | |
| Procrastination index (std.) | 0.070 | -0.178 | -0.110 | 0.000 | 2221 |
| Matriculation date (average) | Aug 13, 2022 | Aug 08, 2022 | Aug 09, 2022 | 0.000 | 2221 |
| Application date (average) | Jun 24, 2022 | Jun 21, 2022 | Jun 21, 2022 | 0.002 | 2216 |
| 1[Missing application date imputed] | 0.07 | 0.04 | 0.04 | 0.021 | 2221 |
| High school GPA (German scale: 1 very good - 4 very poor) | 2.49 | 2.44 | 2.41 | 0.041 | 2221 |
| 1[Missing high school GPA imputed] | 0.01 | 0.01 | 0.02 | 0.643 | 2221 |
| 1[first study program] | 0.74 | 0.808 | 0.763 | 0.021 | 2221 |
| Time between school degree and enrollment (years) | 1.724 | 1.341 | 1.492 | 0.006 | 2221 |
| Observations per group | 1489 | 365 | 367 | | |

*Notes*: Table shows the compliers an non-compliers means of main outcomes at baseline. Compliance defined as open journal link for both treatment groups. Final column reports the p-value of an F-test on the treatment arms not predicting the respective baseline outcome or any of the further variables. Variables in brackets with a leading digit 1 (1[…]) are binary variables. Last row reports the number of students in each group. Small differences in group sizes arise, because randomization was conducted within strata blocks, with some strata blocks having block sizes that were not multiples of four (the number of randomization groups).

### *C. Evidence on Student Engagement*

TABLE A4—ITT EFFECTS ON ENGAGEMENT PROXIES

| *Dep. Var.:* | Sign-up | Sign-up | Attempt | Attempt |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Journal treatment | -0.434 | -0.399 | 0.094 | 0.143 |
| | (0.563) | (0.479) | (0.624) | (0.511) |
| Journ. & commitment treatment | 0.387 | 0.407 | 0.417 | 0.521 |
| | (0.563) | (0.482) | (0.631) | (0.530) |
| Basel. Controls | No | Yes | No | Yes |
| Strata FE | No | Yes | No | Yes |
| R-squared | 0.00 | 0.32 | 0.00 | 0.36 |
| Observations | 2221 | 2216 | 2221 | 2216 |
| *Outcome descriptives (control group)* | | | | |
| mean | 24.9 | 24.9 | 21.0 | 21.0 |
| median | 25 | 25 | 24 | 24 |
| s.d. | 10.5 | 10.5 | 11.7 | 11.7 |
| min | 0 | 0 | 0 | 0 |
| max | 86 | 86 | 78 | 78 |
| *(Joint) significant tests (p-values)* | | | | |
| $H_0$: J = J&C = 0 | 0.364 | 0.268 | 0.791 | 0.605 |
| $H_0$: J = J&C | 0.156 | 0.104 | 0.618 | 0.483 |

*Notes*: Table shows intention-to-treat (ITT) effects on average number of signed up credit points, attempted credit points, and self-reported time learned. 'Journal treatment 'denotes random assignment to the first treatment group. 'Journ. & commitment treatment' denotes random assignment to the second treatment group. Ordinary least squares estimates with robust standard errors in parentheses. The dependent variable 'Time Learned' is constructed based on a combination of student responses in 2 surveys throughout the semester and is reported in hours per week. Baseline controls include Procrastination Index, School GPA, age, time between school graduation and university enrollment, and indicators for being female, having an A-level degree, started the first study attempt, graduated from an out of state school, graduated abroad. Furthermore, all estimations include strata fixed effects. $*$ p < 0.10, $**$ p < 0.05, $***$ p < 0.01.

*D. Experimental Design*

The **learning journal** is offered to students of both treatment groups (**T1** and **T2**) and consists of the following elements. Starting from the second week of the semester until the end of the exam period of the semester, the learning journal gives students the opportunity to reflect on their learning behavior of the last week and to plan ahead until the end of the next week. Specifically, students can enter the following type of information in each week:

1. Study times on each day of the last week in hours, separately for attendance and self-studying. From the second week onward students receive a notification that compares their reported study time to the goals that they initially set for the week (cf. next point).
2. Study time goals for each day of the upcoming week in hours, separately for attendance and self- studying.
3. Positive results they expect from achieving their study time goals.
4. What prevented them from achieving their goals in the last week or could prevent them from achieving their goals in the upcoming week.
5. "if-then" statements on how they will deal with the obstacles that they listed under 4 in the upcoming week.

In each week of the semester, students of the two treatment groups will receive an email reminding them to use the learning journal.

For students in treatment group **T2**, right at the beginning of the learning journal, we additionally provide the offer to sign a **target agreement**, according to which students declare "that I am committed to the study times formulated in the learning journal, and in order to study successfully with adhere to these study times", i.e., the study time goals that they set under question 2. Students are informed that signing the agreement is voluntary and that failing to meet the goals has no consequences under study or examination regulations. The text, however, states that by signing the agreement they show that they are committed to their self-set goals and that this will increase the likelihood of achieving them. Following the taxonomy of Bryan et al. (2010), the target agreement thus constitutes a **soft commitment** device. Students can sign the agreement digitally by ticking a checkbox and entering their first and last name next to it. In case students have signed the agreement, in each week, question 2 includes a notification that reminds them about their commitment.

*E. Randomization Procedure*

Students were assigned to one of the three experimental groups within strata that we constructed based on the following steps:

**1.** We split the sample based on the students' study programs resulting in 21 strata (cf. Table 1).

**2.** To account for differences in students' ability, within each study program, we split our sample at the median of the high school GPA distribution.[23] If this split results in two groups that include at least 24 students, we keep the two groups (14 study programs). For the other programs, we proceed without splitting the sample by high school GPA (7 study programs).[24] The second step results in 35 strata.

**3.** The goal of our final step is to achieve balance along a procrastination proxy that we construct based on the date of application to the university and the date of enrollment at the university, which is our main heterogeneity dimension of interest.[25] To do so, within each of the 35 strata that resulted after the first two steps, we order students according to their value of the procrastination index (ascending order) and split the sample into an even number of smaller groups of at least 12 students.[26] "Surplus" students are distributed across the two strata in the middle of the distribution starting with the stratum with the lower procrastination tendency, e.g., if there are 50 students, we create 4 strata with 12, 13, 13, and 12 students. However, if there are exactly 3 surplus students, they are allocated to one stratum together. E.g., if there are 51 students, we create 4 strata with 12, 15, 12, and 12 students. We create an even number of strata in each study program to be able to split students/strata in each study program into a group of students with low procrastination tendencies (N=1,130) and one with high procrastination tendencies (N=1,091). In total, this process results in 156 Strata.

[23] The high school GPA was missing for 42 observations. To keep the sample complete, we imputed those values based on a linear regression of the high school GPA on age, a female dummy, time since high school graduation in years, a high school degree Abitur dummy, place of high school degree dummies (foreign and other federal state, the reference group federal state is Bavaria), the procrastination index (cf. Footnote 7), a first semester at any university dummy as well as study program dummies, and the interaction of the study program dummies with the other variables.

[24] In three study programs (Applied Materials Science, Civil Engineering, Business Administration), we made a small change to the median split to achieve a more equal distribution of the two groups. E.g., in Business Administration the median split resulted in groups of 221 and 170 students, and we changed the cutoff such that the final split was 194 and 197 students.

[25] To construct the proxy, we used *Stata*'s *swindex* command by Schwab et al. (2020) to calculate the standardized inverse-covariance weighted average (Anderson, 2008) of the date of application for the study program and the date of enrollment. The date of enrollment was first standardized within study programs due to differences in the timelines of the enrollment periods between study programs. For the application date, we first imputed 130 missing observations based on a linear regression of the application date on the application number, study program dummies, and the interaction of the study program dummies with the application number (5 remaining missings are accounted for by the *swindex* command). Afterwards, we standardized the application date within study programs and information on whether students graduated from high school before or after the beginning of the application period, since the application behavior of those two groups differs from each other.

[26] In Energy Process Engineering, which only has 23 students, we split the sample into one group of 12 and one group of 11 students. Due to the removal of duplicates by the university (see Section 2), in the final sample, Social Work also has two strata with only 11 students.

*F. Outcome Variable Definition*

| Variable | Definition |
|---|---|
| **Passed Course Credits** | Credit points obtained in the first semester net of credits granted for an internship and transferred credits. |
| **GPA** | Grade point average at the end of the respective semester (1=best, 4=worst); failed exams are not included in calculation |
| **Dropout** | Indicator for having dropped out of the study program before or in the respective semester. |
| **Academic Index** | Index using a standardized inverse-covariance weighted average (includes: credits earned, GPA, and Droupout) |
| **Procrastination** | Measures procrastination based on using a standardized inverse-covariance weighted average |
| **Credit Signed Up** | Credit points signed up for in the first semester |
| **Credit Attempted** | Credit points attempted in the first semester |
| **Hours Invested in Studying** | Number of hours spent studying during a week |
| **Well-being Outcome** | Index using a standardized inverse-covariance weighted average of responses from 5 questions on well-being (see survey questions for more information) |
| ***Treatment Variables:*** | |
| **Journal Treatment** | Random assignment to the first treatment group |
| **Journal + Commitment** | Random assignment to the second treatment group |

*G. Treatment Documentation*

***Studieren mit Plan***

Guten Tag *Vorname Nachname*,

herzlich willkommen an unserer Hochschule! Wir freuen uns, Sie bei uns begrüßen zu dürfen. Unser Programm ***Studieren mit Plan*** möchte Sie während Ihres ersten Semesters an der TH Nürnberg unterstützen. Hierzu testen wir aktuell verschiedene Angebote:[1]

***Studieren mit Plan*** **für Vorname Nachname, Matrikelnummer 1234567:**

Ihr Studiengang *studiengang* ist ein Präsenzstudiengang, der in Vollzeit angeboten wird. Das heißt, Ihr Studium ist so konzipiert, dass sich für einen Abschluss in der Regelstudienzeit durch alle studienbezogenen Tätigkeiten ca. eine 40-Stundenwoche ergibt. Dieser Zeitumfang ist ein Anhaltspunkt, der für typische Studierende gilt und in Abhängigkeit von Vorwissen, Talenten und den persönlichen Ansprüchen und Lebensumständen unter- oder überschritten werden kann.

**Natürlich wollen Sie Ihre Zeit optimal einsetzen.** Nutzen Sie dazu unser **Lern-Journal!**

**Das Journal begleitet Sie durch das erste Semester.** Sie reflektieren darin kurz Ihr Studier- und Lernverhalten und planen voraus.

**Warum ein Journal führen?** Wissenschaftliche Erkenntnisse zeigen, dass wir unsere Ziele eher erreichen, wenn wir sie aufschreiben und unseren Fortschritt dokumentieren.

Erhöhen Sie Ihre Wahrscheinlichkeit, erfolgreich zu studieren, indem Sie dem QR-Code oder dem Link folgen: Beispiellink

***Studieren mit Plan*** ist keine Einbahnstraße: geben Sie uns **Feedback in zwei 3-Minuten Surveys!** Während des Semesters werden wir uns zwei Mal mit Fragen zum Studium melden. Wir freuen uns über Ihre Rückmeldung.

Bitte beachten Sie auch unsere Hinweise und Beratungsangebote auf der nächsten Seite.

Wir wünschen Ihnen viel Freude und Erfolg beim Studieren an unserer Hochschule!

Mit freundlichen Grüßen

*Ihr KoSIMA-Team*

FIGURE A4. TREATMENT INTERVENTION LETTTER

*Notes*: Figure shows a screenshot of an example of the treatment letter sent to all students in the treatment groups.

***Studieren mit Plan***

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herzlich willkommen an unserer Hochschule! Wir freuen uns, Sie bei uns begrüßen zu dürfen. Unser Programm ***Studieren mit Plan*** möchte Sie während Ihres ersten Semesters an der TH Nürnberg unterstützen. Hierzu testen wir aktuell verschiedene Angebote.[1]

***Studieren mit Plan* für Vorname Nachname, Matrikelnummer 1234567:**

Ihr Studiengang *studiengang* ist ein Präsenzstudiengang, der in Vollzeit angeboten wird. Das heißt, Ihr Studium ist so konzipiert, dass sich für einen Abschluss in der Regelstudienzeit durch alle studienbezogenen Tätigkeiten ca. eine 40-Stundenwoche ergibt. Dieser Zeitumfang ist ein Anhaltspunkt, der für typische Studierende gilt und in Abhängigkeit von Vorwissen, Talenten und den persönlichen Ansprüchen und Lebensumständen unter- oder überschritten werden kann.

***Studieren mit Plan*** ist keine Einbahnstraße: geben Sie uns in **zwei 3-Minuten Surveys Feedback!** Während des Semesters werden wir uns zwei Mal mit Fragen zum Studium melden. Wir freuen uns über Ihre Rückmeldung.

Bitte beachten Sie auch unsere Hinweise und Beratungsangebote auf der nächsten Seite.

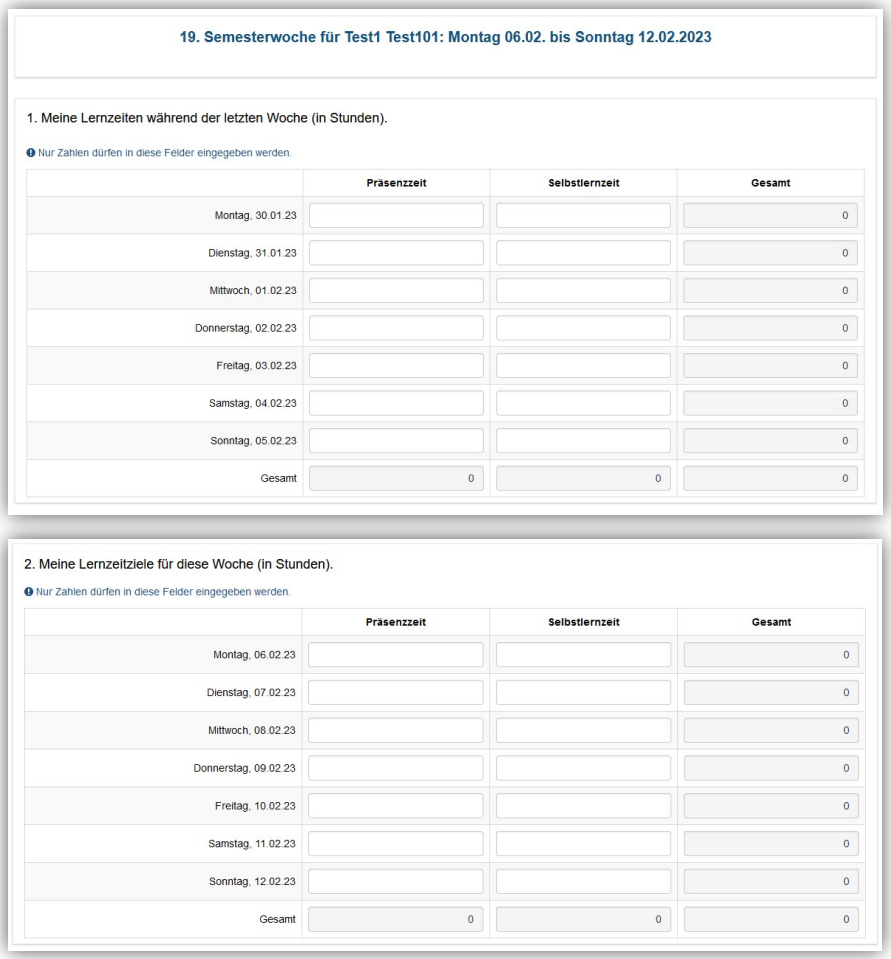
Wir wünschen Ihnen viel Freude und Erfolg beim Studieren an unserer Hochschule!

Mit freundlichen Grüßen

*Ihr KoSIMA-Team*

FIGURE A5. CONTROL LETTER

*Notes*: Figure shows a screenshot of an example of the letter sent to all students in the control group.



**19. Semesterwoche für Test1 Test101: Montag 06.02. bis Sonntag 12.02.2023**

1. Meine Lernzeiten während der letzten Woche (in Stunden).

Nur Zahlen dürfen in diese Felder eingegeben werden.

| | Präsenzzeit | Selbstlernzeit | Gesamt |
|---|---|---|---|
| Montag, 30.01.23 | | | 0 |
| Dienstag, 31.01.23 | | | 0 |
| Mittwoch, 01.02.23 | | | 0 |
| Donnerstag, 02.02.23 | | | 0 |
| Freitag, 03.02.23 | | | 0 |
| Samstag, 04.02.23 | | | 0 |
| Sonntag, 05.02.23 | | | 0 |
| Gesamt | 0 | 0 | 0 |

2. Meine Lernzeitziele für diese Woche (in Stunden).

Nur Zahlen dürfen in diese Felder eingegeben werden.

| | Präsenzzeit | Selbstlernzeit | Gesamt |
|---|---|---|---|
| Montag, 06.02.23 | | | 0 |
| Dienstag, 07.02.23 | | | 0 |
| Mittwoch, 08.02.23 | | | 0 |
| Donnerstag, 09.02.23 | | | 0 |
| Freitag, 10.02.23 | | | 0 |
| Samstag, 11.02.23 | | | 0 |
| Sonntag, 12.02.23 | | | 0 |
| Gesamt | 0 | 0 | 0 |

FIGURE A6. LEARNING JOURNAL

*Notes*: Figure shows a screenshot of week 19 of the semester, as an example.

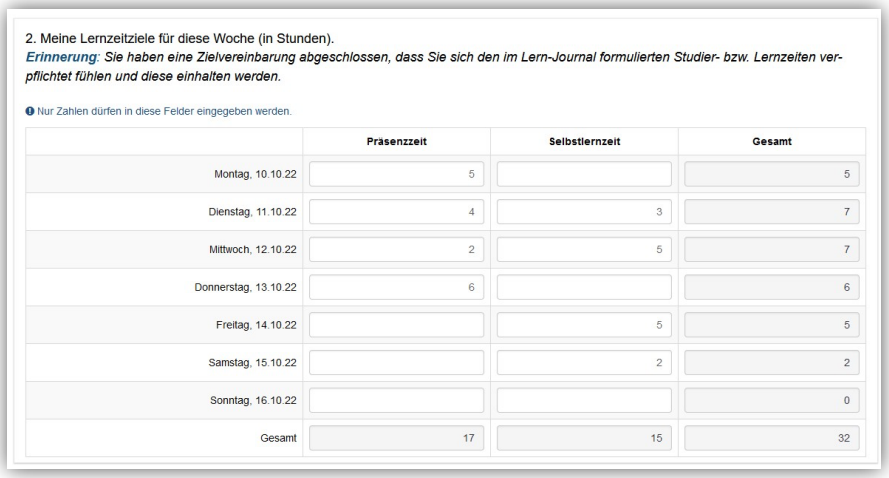



FIGURE A7. LEARNING JOURNAL VIEW FOR THE JOURNAL AND COMMITMENT GROUP

*Notes*: Figure shows a screenshot of the learning journal with a reminder of the commitment device for a student in the second treatment group, who signed the commitment device

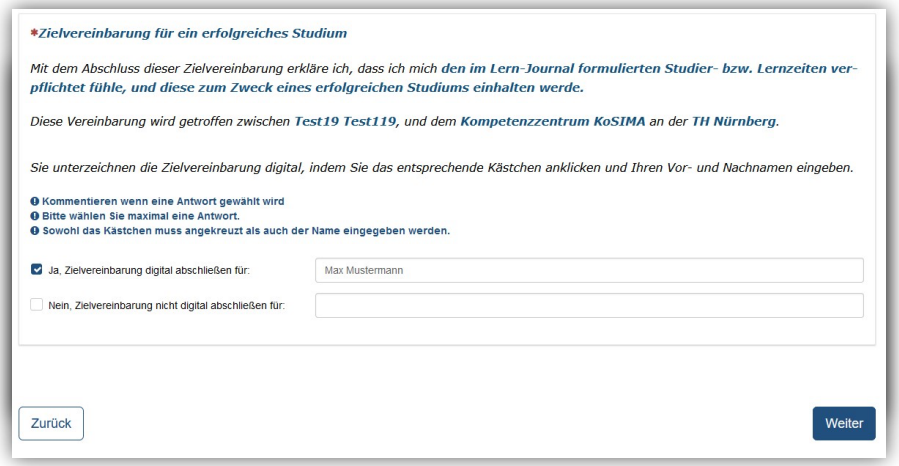



FIGURE A7. COMMITMENT DEVICE

*Notes*: Figure shows a screenshot of the Commitment device offered to the second treatment group.