

## Procrastination, Prompts, and Preferences – Evidence from Daily Records of Self-directed Learning Activities –

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要旨 : To complement the theoretical analysis on the self-control problems of decision makers, this paper empirically examines a remedy for procrastination. The setting for our study is university coursework, and we utilize unique data on daily records of self-directed learning activities. With quasi-experiments arising from the different frequency of interventions across classes, we examine the hypothesis that in-class prompts by an instructor mitigate the degree of procrastination. Further, with a registration mechanism that generates the grouping of students by their own preference, we consider whether student–class matching affects students’ responsiveness to prompts. In a sample of Japanese undergraduates, we find that prompts affect behavior, especially when reinforced. The impact of intervention, however, appears to be dependent on the class preferences and the timing of prompts. The study suggests that a minimally interventionist policy may have real impact but may fail to influence target groups.

キーワード : Time-inconsistent preferences; Monitoring; Skill formation

There is a growing body of studies that examines the self-control problem of decision makers arising from time-inconsistent tastes for immediate gratification (Strotz, 1956; Laibson, 1997).<sup>1</sup> The tendency to seek immediate gratification can lead to suboptimal outcomes after the fact (e.g. health problems due to cigarette consumption), and recent theoretical studies have been concerned with paternalistic intervention policies (Choi, Laibson, Madrian & Metrick, 2003; Thaler & Sunstein, 2003; O’Donoghue & Rabin, 2003, 2006). Those studies highlight the advantages of “minimally interventionist policies” (MIPs) as opposed to heavy-handed policy interventions, arguing that MIPs prevent “causing harm to those for whom the behavior is rational” (O’Donoghue & Rabin, 2003). However, given the lack of hard incentives to change behavior, a concern remains as to what extent MIPs can influence the behavior of target groups. In the economics literature, however, there are relatively sparse empirical attempts to evaluate policy interventions for mitigating self-control problems.

The aim of this paper is to complement the analysis of MIPs with an empirical examination. The setting for our empirical study is a classroom. Since the difficulties in examining the effectiveness of MIPs in the field have limited the development of the empirical literature, we think a student sample is a useful starting point in examining the extent of the impact of MIPs, despite the concern about the generalizability to economic settings. We focus on procrastination, which is defined in the *Oxford English Dictionary* as “the action or habit of postponing or putting something off.” Unlike the negative connotation in the common usage of the word, procrastination does not necessarily lead to worse outcomes (Ferrari, Johnson & McCown, 1995). However, academic procrastination can, depending on the subject matter, affect the degree of human capital formation. Thus, in a setting where delayed actions negatively affect outcomes, procrastination is relevant to economists who are interested in evaluating interventions. The scope of this paper is to consider an intervention that would be relevant when decision makers have present-biased preferences, which is a type of self-control problem that results in procrastination in performing unpleasant tasks. We think that it is intuitive and sensible to attribute procrastination in our setting as due to the present-biased preference, as often presumed in previous studies (Akerlof, 1991; Ariely & Wertenbroch, 2002), but distinguishing between the causes of procrastination is beyond the scope of this paper. Our goal in this paper therefore is to provide empirical documentation of the effects of teacher intervention to mitigate the student action of putting off required assignments.

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<sup>1</sup> For surveys, see O’Donoghue & Rabin (1999, 2005) and Frederick, Loewenstein & O’Donoghue, (2002).

Ariely & Wertenbroch (2002) conducted controlled experiments investigating the effects of deadlines. They found in the context of executive education and part-time work that the average performance was significantly higher in the samples where deadlines were exogenously imposed than in the samples where participants self-selected binding deadlines. The design of incentives is one way by which course instructors attempt to elicit activities conducive to student learning. However, tasks (e.g. a practice of Chinese pronunciation) may be difficult to observe and it may be costly to write learning contracts. Some instructors may prefer a less intrusive form of intervention. A common alternative is verbally prompting students during lectures to undertake certain actions. Although in-class prompting is a ubiquitous instruction strategy, we are not aware of studies that attempt to measure the extent to which teacher prompts mitigate procrastination; perhaps this dearth is due to the costliness in measuring the length of time spent on self-directed learning activities. As a result, while teachers may know from experience that prompting their students to “work” is effective, there remains uncertainty about the extent to which a prompt elicits intended behavior and about the factors that might affect the degree of inducement. Thus, our contribution is to offer a study that examines the impact of in-class prompting on the amount of self-directed learning activities.<sup>2</sup>

Our innovation is that we utilized computer-based records of out-of-class study activities to avoid the difficulty of observing the time spent on self-directed learning. We also focused on a setting where procrastination would hinder the development of a market-valued skill: the English language skill in Japan.<sup>3</sup> A Japanese education-material company has developed self-practice software for the English language, ALC Net Academy (ALCNA),<sup>4</sup> which stores on a server the beginning and end time of each drill, the time spent on each section of a drill in seconds, and the results of practice quizzes. Our study utilized the daily records of over 170 students in English-listening classes taught by an instructor at a Japanese university.<sup>5</sup> In addition to the data availability, the setting is attractive since, according to the conventional wisdom of foreign-language instructors, foreign language listening skill is like athletic skill: routine practice is important in skill development and retention.<sup>6</sup> Thus, unlike essay assignments where one may deliberately procrastinate to gain the level of motivation needed in writing (Ferrari, Johnson & McCown, 1995), procrastination in our setting can reasonably be thought of as being harmful to the rate of skill acquisition. Inevitably, the specificities in our setting limit the generality of our results. But the setting allows us to focus on the type of tasks that will adversely affect procrastinators in the labor market.

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<sup>2</sup> To be sure, the intervention focused on this study is not intended to “cure” the present bias in the preference of individuals but is intended to reduce the extent of postponing assignment completion.

<sup>3</sup> Matsushige (2004) presents evidence from a large-scale survey. At the anecdotal level, numerous Japanese companies use scores on a standardized test of English as the criteria for promotion and pay increases. The English-language education industry is ubiquitous in Japan and testifies to the importance of the language.

<sup>4</sup> ALCNA is commercial language practice software adopted in 166 universities and colleges across Japan (<http://www.alc.co.jp/netacademy/list.html>, accessed March 8, 2007).

<sup>5</sup> The data used in this study was obtained and used in accordance with the host university’s privacy policy.

<sup>6</sup> This assertion is based on our communications with various foreign language instructors. Short intensive exposures to foreign languages, such as a one-month language camp, are also thought to be effective in raising skill levels. However, the focus of our study is in a college setting where there are several constraints on resources available for language teaching. One might view that there are individual variations in the “optimal study pattern” or the study method that maximize the rate of skill acquisition. If, for example, the skill level of a student is far beyond what is presumed by the software developers, procrastination is unlikely to affect the degree of skill acquisition. The skill levels in English among the student sample are fairly homogeneous given the university admission process.

Another advantage of the setting is that it allows us to examine factors that may affect responsiveness to intervention. The response to prompts is voluntary and does not trigger a direct penalty in the event of non-compliance. One would thus be concerned that, for some students, prompts would be “like water rolling off a duck’s back.” A host of factors may affect responsiveness, including, but not limited to, intrinsic interest in the subject taught in class, teacher–student rapport, and student compliance. Our data is based on classes where the instructor, common to all classes, experimented with two different ways of prompting students: one group received a single prompt in the 13th week of semester while the other group was prompted in earlier weeks and was being reinforced by follow-up prompts in subsequent weeks. We took advantage of class variation in the intervention methods to see whether the timing and the reinforcement matter. Another interesting feature of the setting is that we were able to observe information regarding class preferences of students through a somewhat archaic system adopted in a compulsory course to allocate students to different classes. Based on the administrative record of preference groupings, we examined whether the responsiveness to prompts was influenced by the student preference for the class. In short, this paper presents a quasi-experiment aiming to identify the effects of verbal prompts and the factors affecting their effectiveness. Clearly, this study is not a laboratory experiment and it is not feasible to implement “clean” experimental designs, since the form of intervention is largely dictated by what the class instructor deems fair to the students (for instance, one possible experimental design, which was not implemented because the teacher did not think it was fair to treat students differently, would be to intervene in one class but not in another). Given the sparseness of the previous studies, however, we think this quasi-experiment is a reasonable starting point.

We present analyses from three approaches that complement one another. The first two approaches are intended to establish the short-term causal impacts of prompts on the amount of time spent on self-directed study. First, we utilized the timing of the intervention, which can be viewed as largely exogenous, and compared the study patterns on the week of the prompt with those from the prior week. The key assumption in this first-difference approach is that, for an identical set of individuals, had there been no intervention, the average study pattern over two weeks would have been the same. Second, we utilized the class variation in the timing of the intervention and implemented a difference-in-difference analysis. This approach assumes instead that the average change in the study patterns across two weeks would have been the same across two sets of individuals. In our view, these assumptions are reasonably weak. Due to the short time frame, however, this approach is unable to pinpoint the semester-level reduction in the degree of procrastination attributable to the intervention. To provide an upper-bound estimate on the effects of prompts, rather than to offer additional evidence on causality, we compared the average degree of procrastination between classes with a single prompt and those with multiple prompts. We interpreted the difference, after controlling for observable differences, as an upper estimate of the effects of reinforced prompts on the degree of procrastination.

In summary, the evidence suggests that verbal interventions by instructors can be instrumental in reducing the degree of procrastination. The first-difference approach was used to analyze the sample with a single intervention. The average treatment effect was an extra 23.7 minutes per week of self-directed study. The magnitude is large since the average study time was 18.1 minutes in the prior week. One factor that influenced the magnitude was the timing. Our examination suggests that students do not respond as much when the assignment deadline is not close. Another factor is the sample attrition. There were systematic variations by the preference grouping in the rates of students not completing the class. To the extent that those who withdrew from the class were those who were not well matched to the class, the attrition process would make the sample conducive to finding the positive impacts of the prompts. After controlling for the attrition bias using the standard sample-selection model, there was a reduction in the magnitude of the point estimates. Along with the results that appear to suggest a stronger effect on the sample of students enrolled in the class as the first choice, we

interpret the results as indicating the effects of student preference on the responsiveness to prompting. Finally, the reinforcements helped reduce the degree of procrastination. We captured the degree of procrastination using the Herfindahl–Hirschman Index (HHI) of weekly study time. The average HHI was 0.09 less for the frequent-prompt classes than for the single-prompt classes. Roughly speaking, a reduction in HHI from the sample average of around 0.3 to 0.2 implies two additional weeks of attending the language lab under the assumption that the student worked the same hours per week during the week in which s/he has attended the lab.

Overall, our study suggests that in-class prompting help mitigate procrastination but its effectiveness can vary by students. Given the specificities of the study setting, this paper should be viewed as an early attempt. It would seem, though, worthwhile to investigate whether verbal prompts can moderate other manifestations of self-control problems such as smoking and overeating.

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