Not Through Fear But Through Habit.

Procrastination, cognitive capabilities and self-confidence

Marco Novarese and Viviana di Giovinazzo
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Marco Novarese* and Viviana Di Giovinazzo*

Abstract
In this paper we use data generated within an electronic learning environment to explore the relationship between procrastination and academic performance. Our findings suggest that while procrastinators do obtain lower marks, they show the same cognitive capabilities and the same level of confidence in their knowledge as non-procrastinating students. The results also show that students are, at least in part, aware of their tendency to delay, when they choose to postpone their task, but that delayed deadlines do not improve performance. The tendency to procrastinate is more likely a behavioural tendency than a rational choice reflecting a study strategy.

Keywords: procrastination; academic performance; cognitive capabilities; self-confidence

Introduction
The procrastination literature has long assessed the negative effect on student performance of the tendency to delay study (Ellis and Knaus 1977; Semb et al. 1979). This result has been tested in different ways. One interesting method, most used by psychologists, is to enquire into the promptness in turning in term papers in North-American universities (see, for example, Beswick et al. 1988; Effert and Ferrari 1989; Schouwenburg 1992; Senecal et al. 1995; Dewitte and Schouwenburg 2002; Howell et al. 2006; Reuben et al. 2009). However, researchers have not yet reached a consensus on the relationship between procrastination and students’ performance. Solomon and Rothblum (1984), for example, identify the fear of failure, which takes the form of performance anxiety, lack of self-confidence and perfectionism, as a major reason for college students’ tendency to procrastinate, while Tice and Baumeister (1997) find that procrastinators experience less stress than non-procrastinators early in an academic semester. Onwuegbuzie (2000) links procrastination with socially imposed perfectionism. According to Dewitt and Schouwenburg (2002), “procrastinators postpone one or more of their intentions mainly because of fun alternatives, but did not intend to study less or later” (p. 469). Chu and Choi (2005) report that, in some cases,
students actively choose to procrastinate because they find beneficial to work under pressure. As regards gender, some studies (Reasinger and Brownlee 1996; Prohaska et al. 2000; Brownlow and Reasinger 2000) conclude that men procrastinate more than women, while others (e.g. Owens and Newbegin 2000) found no significant difference between genders in their degree of academic procrastination. Other variables that have been investigated in relation to student procrastination include self-regulation, self-efficacy, self-esteem (Senecal et al. 1995; Haycock et al. 1998; Wolters 2003; Ferrari et al. 2005; Howell 2006).

In some of these surveys, researchers asked students to rate their tendency to procrastinate and correlated the obtained values with some indicator of academic performance (e.g., Solomon and Rothblum 1984; Beswick et al. 1988). However, in all these studies the presence of a direct causation between study delay and performance remained difficult to detect. Indeed, it was not possible to ascertain if students who hand in well before the deadline perform better than those who hand merely in time, for example, half way towards the deadline. In order to overcome this obstacle, the most recent studies used an electronic learning environment to explore data on actual study behaviour rather than analysing data on study outcomes. The novelty of these studies is that they make it possible to investigate students’ behaviour on the basis of hard data instead of introspective results alone. In an experiment by Burger et al. 2009, students’ activity (on-line and off-line) was observed by monitoring a location in a campus library. As the authors themselves admitted, however, the room was only intermittently monitored and students had access to both computers and wireless Internet. Therefore, there was no certainty about how much of the students’ time in the library was devoted to studying. Schimming (2012) attempted to find quantifiable measures of academic procrastination using a series of web-based homework exercises. Non and Tempelaar (2014) observed the study behaviour in an electronic learning environment (MyLab) in order to analyse the relation between time preferences, study efforts and academic performance.

In this paper we contribute to this more recent literature by investigating the relationship between procrastination and academic performance, using data from a blended e-learning course developed within a Moodle environment. The paper proceeds as follows. In Section 1 we formulate some hypotheses on the relationship between the tendency to procrastinate and students’ performance. Section 2 describes the background of our study and presents the data. Section 3 provides the results, while the next section discusses them. A brief conclusion follows.

1. Hypotheses

Elsewhere (Novarese and Di Giovinazzo 2013), we used data on students’ promptness in enrolling in university as a proxy of procrastination. We found that those who enroll near the deadline do fewer exams, obtain fewer credits and have a lower average mark than those who enroll
promptly. Our data also showed that different proxies of procrastination, such as, students’ delay in enrollment in the various university years or for individual exams, are strongly correlated with each other, suggesting a personal behavioural tendency to procrastinate. This paper looks directly into different forms of procrastination, i.e., postponing an exam date and delaying homework. In particular, we examine if 1) those that start to study later in the semester also obtain lower marks; 2) procrastinators have different cognitive capabilities and self confidence from students who promptly accomplish their tasks; 3) the tendency to procrastinate is related to a rational study strategy or to a personal behavioural characteristic.

2. Data description

We collected observations of 260 students in a blended e-learning course of Principles of Economics, an introductory course of Economics for freshmen at the University of Eastern Piedmont, Alessandria (Italy), in 2013. The exams consisted of a mid-term exam and a final exam.

The mid-term exam consisted of 2 sets of 3 multiple-choice questions on a Moodle platform. The first set consisted of 30 questions, giving 1 point for each correct answer, -0.25 for each wrong answer and 0 point for blank answers. Students had 30 minutes during which to answer. Questions were extracted randomly from a dataset of more than 300 possible items divided by book chapter; therefore, each student worked on a different exam sequence of questions. The second set of questions included 6 additional ones devised to ascertain the students’ level of confidence in the correctness of their own answers. The confidence level was calculated using the Moodle Confidence-Based Mark (CBM) system (very confident, quite confident, not confident). Thus, we awarded 0.75 extra-points to students who answered correctly with a high level of confidence, while we subtracted 1.5 points if the answer was wrong, again with high confidence. No points were given for blank answers (see Table 1). Thus, students were potentially allowed a total of 4.5 additional points. They were given four extra-time minutes to answer these test.

<table>
<thead>
<tr>
<th>Prediction</th>
<th>Correct answer</th>
<th>Wrong answer</th>
<th>Blank answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very confident</td>
<td>0.75</td>
<td>-1.5</td>
<td>0</td>
</tr>
<tr>
<td>Quite confident</td>
<td>0.5</td>
<td>-0.5</td>
<td>0</td>
</tr>
<tr>
<td>Not confident</td>
<td>0.25</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Importantly, students were allowed to choose between three possible dates for taking their mid-term exam, namely November 4, 5 and 6. On those days, which were known to the student from the beginning of the course, on September 23, there were no classes and students did not have any other term exams. The students’ choice among these dates was made in the period October 17 -
This allowed us to investigate whether the opportunity to choose the date of an exam, even though itself part of the measure of procrastination, contributed to reducing the eventual negative effects of students’ tendency to procrastinate, by affecting the other constituent of the measure, namely the promptness with which they began to study.

In order to be allowed to take the mid-term exam, students had to complete a series of online homework exercises on the Moodle platform, whenever and wherever it suited them best, at home or at the university. The given exercises allowed us to distinguish between logical capabilities and competences related to study and, therefore, to observe if non-procrastinators perform better than procrastinators where study, in particular, is concerned. Besides and mainly these tests allowed us to monitor promptness to study. The quiz mark was not included in the overall course mark and the solutions were made available after the answers were submitted, allowing the participants to check their preparation.¹

We focused on the first four homework exercises completed: quiz 1 and quiz 2 were logic tests. In quiz 1, students were asked to fill a blank space to complete some sentences, choosing between the word “economy” and “economics”. The quiz did not require any study, since the meaning of the difference between the two words was specified in the introductory part of the quiz. In quiz 2, students were asked to declare if the sentence had a positive or a normative meaning. Here, too, the difference between the two meanings was explained in the introductory part of the quiz. On the contrary, quiz 3 and quiz 4 required the study of Chapter 1 and Chapter 2 of the textbook, respectively.

3. Results

§ 3.1 Procrastination and academic performance

All the 260 students enrolled in the course registered for the mid-term exam, choosing between the three available dates. The groups (T=1; T=2; T=3) were composed of fairly equal numbers of students (89; 91; 80). Table 2 offers some statistics on students performance in the online homework quizzes for each of the three exam-date groups. Marks were calculated following the same ratio applied to the homework exercises for the three groups of students: it depended on the number of points obtained for correct, blank and wrong answers. The quiz mark was calculated using the same parameters of the exam mark, where 18 corresponded to the minimum mark and 30 the maximum mark.

¹ For our purposes, we took into consideration the mark students obtained in their first attempt but multiple attempts were allowed.
Table 2. Homework. Student average performance for each of the three mid-term exam-date group

<table>
<thead>
<tr>
<th></th>
<th>T=1</th>
<th>T=2</th>
<th>T=3</th>
<th>P-value</th>
<th>P-value K-W test</th>
</tr>
</thead>
<tbody>
<tr>
<td>mark quiz 1 (&quot;economy&quot;/&quot;economics&quot;)</td>
<td>23.2</td>
<td>22.4</td>
<td>21.4</td>
<td>0.293</td>
<td>0.250</td>
</tr>
<tr>
<td>mark quiz 2 (&quot;normative&quot;/ &quot;positive&quot;)</td>
<td>18.06</td>
<td>13.99</td>
<td>15.54</td>
<td>0.002</td>
<td>0.002</td>
</tr>
<tr>
<td>mark quiz 3</td>
<td>10.31</td>
<td>10.14</td>
<td>10.36</td>
<td>0.981</td>
<td>0.988</td>
</tr>
<tr>
<td>mark quiz 4</td>
<td>25.2</td>
<td>22.7</td>
<td>23.7</td>
<td>0.008</td>
<td>0.001</td>
</tr>
<tr>
<td>Needed days to complete quiz 1</td>
<td>6.0</td>
<td>7.4</td>
<td>10.6</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Needed days to complete quiz 2</td>
<td>6.7</td>
<td>7.8</td>
<td>11.5</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Needed days to complete quiz 3</td>
<td>4.8</td>
<td>6.1</td>
<td>9.0</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Needed days to complete quiz 4</td>
<td>4.2</td>
<td>3.5</td>
<td>7.9</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Results in Table 2 show that:

- students that scheduled their exam one day or two after the first available day are also significantly slower in completing homework quizzes;

- student performance in quiz 1 and 2 (the ones that don’t require study) was moderately lower, but the difference was not significant;²

- student performance in quiz 3 and 4 was significantly different among groups; students that scheduled the mid-term exam for a later date obtained significantly lower homework marks.

Table 2 reveals a procrastination tendency: students that postponed the exam date were also late in accomplishing their homework. Thus, students did not seem to take advantage of the opportunity to choose among different possible exam dates in order to be more prepared for their exam. The data also show that more prompt students performed better than procrastinators, but only when some study was required. Thus, procrastinators do not seem to have lower cognitive capabilities than prompt students.

The average values series in Table 3 describes the mid-term exam performance of the three student groups.

Those that decided to take the exam the first available day,

- on average, obtained a point more in the exam than students that took the exam the second day and, almost 2 points more than the last-day students;

- completed the exam earlier than the others (on average 90 seconds before the others in the total of 30 minutes available).

² In quiz 2 the average mark is very poor for almost all students.
Table 3. Mid-term exam. Student average performance for each of the three mid-term exam-dates

<table>
<thead>
<tr>
<th></th>
<th>T=1</th>
<th>T=2</th>
<th>T=3</th>
<th>P-value Anova</th>
<th>P-value K-W test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mark (out of 30)</td>
<td>22.83</td>
<td>21.75</td>
<td>21.10</td>
<td>0.040</td>
<td>0.008</td>
</tr>
<tr>
<td>Seconds</td>
<td>1483.56</td>
<td>1575.29</td>
<td>1573.96</td>
<td>0.063</td>
<td>0.051</td>
</tr>
<tr>
<td>Wrong answer</td>
<td>5.27</td>
<td>6.20</td>
<td>6.16</td>
<td>0.155</td>
<td>0.210</td>
</tr>
<tr>
<td>N</td>
<td>89</td>
<td>91</td>
<td>80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As for the homework, more prompt students performed better than procrastinators, although the number of wrong answers was not significantly different; so prompt students had less unanswered questions. Procrastinating students took more time to accomplish the exam, presumably, because they studied less and, therefore, they needed to think more about a possible answer. Unanswered questions probably revealed just a worst study (students didn’t answered when they didn’t even remember what argument a question dealt with);

Table 4. Correlation coefficients between the mid-term exam mark and the homework marks

<table>
<thead>
<tr>
<th></th>
<th>Quiz 1</th>
<th>Quiz 2</th>
<th>Quiz 3</th>
<th>Quiz 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam mark</td>
<td>0.25**</td>
<td>0.02</td>
<td>0.29**</td>
<td>0.23**</td>
</tr>
</tbody>
</table>

** values significant to 99% either with Pearson test or with Kruskal-Wallis test.

Table 4 shows the Pearson correlation coefficients between the mid-term exam mark and the homework quiz marks. Table 5 shows the correlations between the mid-term exam mark and the number of days students took for the completion of their online homework (according to the day from which the quiz had been made available on Moodle; a student completing his homework the first possible day had a value equal to zero, and so on). Table 6 presents the correlations between the number of days students took for registering for the mid-term exam and the time taken for the completion of their online homework (students enrolling the first day had a value equal to zero and so on).

Table 4 shows positive and significant correlation between the mid-term mark and the homework mark, except for quiz 2, whose average mark, overall, was very low. The exam mark was negatively correlated with the number of days necessary to accomplish the homework quiz (Table 5): more prompt students completed the quiz earlier and performed better than procrastinators. Students that decided to register for the mid-exam later were also late in completing their homework (see Table 6). With reference to these values, the cause-effect relationship may be twofold: it is possible that students that completed their homework exercises later tended to also
register later. It may also be the case that students that planned to schedule the exam later may have postponed completion of their homework accordingly or, equally, those who took the full time to accomplish their task showed this tendency in all their activities. Either way, the data showed an individual tendency to procrastinate that is consistent across activities.

Table 5. Correlation coefficients between mid-term exam marks and the days necessary for homework completion

<table>
<thead>
<tr>
<th>Quiz</th>
<th>Exam mark</th>
<th>Quiz 2</th>
<th>Quiz 3</th>
<th>Quiz 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz 1</td>
<td>-0.26**</td>
<td>-0.24**</td>
<td>-0.31**</td>
<td>-0.20**</td>
</tr>
</tbody>
</table>

** values significant to 99% either with Pearson test or with Kruskal-Wallis test.

Table 6. Correlation coefficients between the delay in registering for the mid-term exam and the days necessary for homework completion

<table>
<thead>
<tr>
<th>Quiz</th>
<th>Exam subscription</th>
<th>Quiz 2</th>
<th>Quiz 3</th>
<th>Quiz 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz 1</td>
<td>0.28**</td>
<td>0.27**</td>
<td>0.23**</td>
<td>0.30**</td>
</tr>
</tbody>
</table>

** values significant to 99% either with Pearson test or with Kruskal-Wallis test.

Students were allowed to take the final exam either on December 19, or on January 10. Table 7 shows the percentage of students taking the final exam on December 19 and their average mark.

Table 7. Final exam. Student average performance for each of the three mid-term exam-date group

<table>
<thead>
<tr>
<th></th>
<th>T=1</th>
<th>T=2</th>
<th>T=3</th>
<th>P-value Anova</th>
<th>P-value K-W test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of students who attended the final exam</td>
<td>0.81</td>
<td>0.87</td>
<td>0.66</td>
<td>0.004</td>
<td>0.005</td>
</tr>
<tr>
<td>Mark (out of 30)</td>
<td>23.34</td>
<td>22.10</td>
<td>21.42</td>
<td>0.147</td>
<td>0.093</td>
</tr>
</tbody>
</table>

The most significant difference here concerns the percentage of students that chose to give the final exam the first available sitting. Over 80% of the students that took the mid-term exam on either the first or the second day available chose to take the final exam in December, while less than 70% of the students that took the mid-term exam on the last day available chose to take it at the same date. The procrastination tendency pattern is therefore again confirmed. Considering that heavy procrastinators – that is, those students that chose to take the final exam in January – are not included, we noticed that the average mark decreases according to the exam date. Those who postponed the exam also obtained lower marks, but the difference is not very significant.
§ 3.2 Procrastination, cognitive capabilities and self-confidence

In order to measure students’ confidence, we developed the following parameters on the basis of the CBM quiz (for a more detailed analysis, see Lotito et al. 2014).

Table 8. Confidence parameters

<table>
<thead>
<tr>
<th></th>
<th>T=1</th>
<th>T=2</th>
<th>T=3</th>
<th>P-value Anova</th>
<th>P-value K-W test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overc</td>
<td>-0.72</td>
<td>-0.95</td>
<td>-0.70</td>
<td>0.802</td>
<td>0.581</td>
</tr>
<tr>
<td>Lw</td>
<td>-0.92</td>
<td>-0.89</td>
<td>-1.07</td>
<td>0.522</td>
<td>0.832</td>
</tr>
<tr>
<td>Gc</td>
<td>-0.59</td>
<td>-0.51</td>
<td>-0.52</td>
<td>0.603</td>
<td>0.900</td>
</tr>
</tbody>
</table>

Points for correct answers (GC) = points obtained for correct answers / number of correct answers.

Given that the correct answers with a high confidence level are associated with a high score, the value of this parameter is very high for students that are more confident about their knowledge.

Points lost for wrong answers (LW) = points lost for wrong answers / wrong answers.

The more negative this parameter, the higher the students’ confidence. This parameter has a negative value or is, at least, equal to 0: when mistakes are associated with a low confidence level, students do not lose points.

Overconfidence parameter (OVER) = (wrong answers with a high confidence *2) + wrong answers with a moderate confidence level – correct answers with a moderate confidence level – (correct answers with a low confidence level *2).³

This parameter assigns a high positive value to the wrong answers associated with a moderate or high level of confidence in their correctness. It assigns a negative value to the correct answers associated with a moderate or low confidence level. The parameter value of, for example, 6 wrong answers associated with a high confidence level is (2*6). The parameter value of a perfect exam (30 correct answers) associated with a low confidence level is (-2*6). The parameter value is equal to 0 for students with a perfect knowledge on their evaluation capability or for students who do not make mistakes.

The parameters in Table 8 show no significant differences: students that delayed their tasks had the same confidence level as the others.

³ Different versions of the same parameter with different weights attached to the same addenda gave similar results.
4. Discussion

As expected, the marks obtained by procrastinators and non-procrastinators in the various quizzes suggest the presence of a relationship between the tendency to procrastinate and academic performance: students that completed their online homework later obtained a lower mark. Our results also showed that having more time to prepare an exam neither helps reducing the tendency to procrastinate nor improves student performance. Therefore, postponing the exam date can be considered more likely to be a procrastination tendency than a study strategy. Nonetheless, procrastinators did not seem to display different cognitive capabilities from those of more prompt students. Lastly, on average, procrastinators showed the same confidence self-evaluating capability as non-procrastinating students and the same confidence level in their abilities: procrastinators were not more insecure than non-procrastinators about their own knowledge.

Conclusion

Our data allowed us to identify some distinctive features connected with the student tendency to procrastinate, which still await clarification in the related literature. Our findings showed that procrastinators do obtain slightly lower marks but do not show lower cognitive capabilities than more prompt students. Also, we found that students are, at least in part, aware of their tendency to delay when they choose to postpone their task, and that delayed deadlines do not improve performance. Therefore, procrastination is more likely a behavioural tendency than a study strategy. Give that procrastinators have the same confidence level as prompt students, we can conclude that their procrastination is not caused by fear of failure or low self-esteem.

Our findings showed that allowing students more time to study does not improve their performance. This suggests that the education policy most likely to reduce procrastination would be one designed to make subjects more responsible for the consequences of their study-time management – for example, through the adoption of commitment devices, such as externally-imposed deadlines (Ariely and Wertenbroch 2002).
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