

Predicting procrastination with academic performance: Towards the anticipation of a higher education problem

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Received December, 2021

Accepted February, 2023

Abstract

Purpose: With the purpose of predicting the problem of procrastination, we study how age, sex, type of studies and grade for admission to higher education influence the procrastination behavior of students.

Design/methodology: In a sample of 359 university students, the Pure Procrastination scale was applied, as well as data on sex, age, grade previous to join the university, grade completed and year of study (first to fourth). To identify underlying variables or factors that explain the configuration of correlations in the items of the scale used, an exploratory factor analysis was carried out (principal component analysis with Varimax normalization). Next, a multiple linear regression analysis was performed with the variables sex, age, and admission grade as independent variables and academic procrastination as the dependent variable.

Findings: It has been possible to identify the variables that influence the procrastinating behavior of university students. From the identification of which students will possibly present procrastinating behaviors, the people responsible for university education will be able to implement intervention programs to deal with procrastination.

Research limitations/implications: The sample is not representative of the universe of university students, although the results obtained are relevant enough to replicate the study in other university contexts. Our data could have included more instruments for collecting information, which in future studies would entail incorporating scales related to the perception of time management, motivation or self-regulation.

Practical implications: Distinguishing, among university students, those who may present more procrastination tendencies will guide those responsible for the educational process of said students with respect to measures to alleviate the negative effects of procrastination through psycho-socio-educational intervention programs.

Social implications: The knowledge derived from this work has practical implications for the students themselves who, in the case of being identified as a potential procrastinator, may benefit from a psycho-socio-educational intervention that will help them manage their time and reduce the discomfort derived from the procrastination.

Originality/value: On the previous corpus of existing scientific knowledge, this work provides knowledge that allows optimizing, both at a public and private level, the academic, economic and social resources of university institutions in which procrastination can affect the preparation and the student performance.

Keywords: Academic procrastination, University students, Sex, Age, Academic performance

Jel Codes: I21, I23, I26

To cite this article:

Mastrantonio, M.P., Pestana, J.V., & Codina, N. (2023). Predicting procrastination with academic performance: Towards the anticipation of a higher education problem. *Intangible Capital*, 19(2), 316-327. <https://doi.org/10.3926/ic.2011>

1. Introduction

There is a generalized agreement in affirming that procrastination – understood as delaying the beginning, the conclusion, or the beginning and conclusion of an activity which one intends to do (Lay, 1986) – negatively affects students' academic performance (Steel, 2007; Rozental & Carlbring, 2014; Rodríguez & Clariana, 2017). In a university, procrastinating behavior among students is an object of profound concern by teachers; to a large degree, this is because of the constant demonstration of this behavior in continual evaluation activities which take place in universities according to the Bologna Process (Rodríguez & Clariana, 2017; Calderón & Gustems, 2020; Naturil, Marco-Jiménez, Salvador Vicente, & Peñaranda, 2018) and the evidence that while students with strong procrastinating tendencies are less likely to pass, students with low procrastinating tendencies pass more often, and finish their university studies in the time set by the curriculum (Bruinsma & Jansen, 2009).

Studies on procrastination, which began to take place systematically and with ever-growing numbers of researchers beginning in the 1980s, have created enormous progress in knowledge about the phenomenon (Díaz-Morales, 2019; Lay, 1986). In fact, procrastination significantly impacts academic performance, even more than class attendance (Johnson & Onwuegbuzie, 2004; Rodarte-Luna & Sherry, 2008; Wang & Englander, 2010).

Based on these ideas, we should expect that part of the university student population engages in procrastinating behavior. To face or prevent this, teachers may find it very useful to know what can help predict this behavior. To aid this goal, this research intends to study how factors such as student age, gender, major, and grades upon entering higher education, can all help predict procrastinating behavior. This prediction can be very useful to warn teachers, as well as to identify a problem for intervention from the first year of university, thus helping to ensure – at least partly – better academic results and graduation in the time frame estimated by the academic curriculum.

2. Literature review

Procrastination consists of “voluntarily delaying a foreseen course of action despite the negative consequences it involves” (Steel, 2007). It is also a maladaptive behavior since it generates psychological, physical, and social malaise that manifests (among other consequences) in the form of stress, anxiety, depression, project abandonment, and low academic performance (Ferrari & Pychyl, 2000; Garzón Umerenkova & Gil Flores, 2016; Kim & Seo, 2015; Sirois, Melia-Gordon & Pychyl, 2003).

In academic contexts, student procrastination is highly interesting for educators and researchers, since procrastinating students tend to have low academic results (Steel, 2007; Zhang, Dong, Fang, Chai, Mei & Fan, 2018); be dissatisfied with life and their studies (Grunschel, Patrzek & Fries, 2013); have unhealthy behaviors, facing mental and physical health problems (Khalid, Zhang, Wang, Ghaffari & Pan, 2019; Sirois, 2007; Sirois & Tosti, 2012); and in severe cases, can even suffer depression (Saddler & Sacks, 1993; Uzun Ozer, O’Callaghan,

Bokszczanin, Ederer, & Essau, 2014). Apart from these negative effects, academic procrastination (which negatively affects academic tasks relevant for learning) can easily become a behavioral habit beyond the academic context, when tasks are not motivated in other daily life areas (Díaz-Morales, 2019). This behavior can become chronic and does not only occur during adolescence, becoming a lifestyle element. This situation occurs in around 15% to 20% of adults (Ferrari, 2001; Ferrari, Díaz-Morales, O’Callaghan, Díaz & Argumedo, 2007) and 80% of students (Steel & Ferrari, 2013). Its effects vary widely, ranging beyond those mentioned above. Various problems have been identified which derive from academic procrastination in areas related to time management (Codina, Castillo, Pestana & Balaguer, 2020; Codina, Pestana, Valenzuela & Giménez, 2020; Codina, Valenzuela & Pestana, 2020; Garzón Umerenkova & Gil Flores, 2016; Pestana, Codina & Valenzuela, 2020), physical health (Sirois et al., 2003; Sirois & Tosti, 2012; Stead, Shanahan & Neufeld, 2010), mental health (Sadler & Sacks, 1993; Fernie, Bharucha, Nikčević & Spada, 2017; Flett, Haghbin & Pychyl, 2016; Khalid et al., 2019; Rice, Richardson & Clark, 2012) and even in financial management (Klingsieck, Grund, Schmid & Fries, 2013).

Given these implications of procrastination, it is useful to try as much as possible to anticipate the rise of procrastinating behaviors among students as soon as they enter university. A single model can be made to integrate variables which have been correlated on various occasions, but with partially conclusive results. This can make room for corrective actions via tutoring or other orientation practices. In this sense, the present study is interested in knowing about procrastinating behavior at the moment when university students begin their first year, according to data such as gender, age, grades upon entering university, and the level to study. Given these factors’ importance, it has been warned that academic procrastination is stronger among men than women (Balkis & Duru, 2009; Chan, 2011; Mejía, Ruiz, Benites & Pereda, 2018). These findings are not conclusive, though, since other studies have not shown any significant differences, including Abado and Cáceres (2018), who found no significant academic procrastination level differences by gender, with both men and women having high average procrastination levels.

Varying results for this prior evidence show the need to integrate different variables associated with procrastination into one explanatory model. In particular, we refer to variables which are already present upon entering university (such as age or sex, among others), and not those which can arise while progressing through the level (motivation for certain courses or possible new stress sources). Our study presents the following five hypotheses (each of which is duly justified based on prior evidence):

H1: Procrastinating behavior depends on sex, and is more frequent in men than women.

For age, there is more consensus regarding behavior: academic procrastination drops with age as students advance through their academic courses (Blouin-Hudon & Pychyl, 2015; Rodríguez & Clariana, 2017; Steel, 2007; Steel & Ferrari, 2013, van Eerde, 2003). These findings ground our next hypothesis:

H2: Younger students procrastinate more than older students.

Procrastinating behavior begins well before university. According to Clariana, Gotzens, Badia and Cladellas (2012) high school students tend to procrastinate less during their first years of secondary schooling, but when they enter their later years and their first year of university they show greater tendencies to procrastinate, which ultimately tend towards moderation by their final year of university. This leads us to the next hypothesis:

H3: Procrastinating behavior is related with the current academic level of the student, is stronger in the first year, and decreases as they advance in their university studies.

Specifically, knowing students’ academic performance prior to university can be an indicator of future procrastinating tendencies. We thus wish to know whether grades upon entering university can be an indicator of future procrastination. This leads us to the next hypothesis:

H4: Students with lower grades upon starting university tend to procrastinate more than those with better grades.

Finally, some studies show that students’ majors can be a factor driving higher procrastination levels. Barrantes (2018) explains that Business Administration students procrastinated more than Psychology students, although

there are few references to this case. Since we know the two academic major which students can study in our case, we have presented the following hypothesis.

H5: Business administration students have more procrastinating behavior than Marketing and Digital Communications students – both cohorts in a single study center.

Together, we wish to test the degree to which grades upon entering university, together with data such as gender, age, academic major, and grade level predict future procrastination in students. This proof can lead to a model which can aid with early diagnosis, thereby orienting teaching-learning methodologies to fight this phenomenon. Another element, at least potentially, is to provide empirical grounds for university professors to train themselves in order to face this problem, once procrastination manifest as a habitual behavioral style in a university setting.

As mentioned by Steel and Klingsieck (2016), few interventions are based on principles discovered in research, with some exceptions (Häfner, Oberst & Stock, 2014; Grunschel, Patrzek, Klingsieck & Fries, 2018). In effect, research provides answers which are not easily applied or transferred into an educational environment. The reasons for this include a lack of a single intervention strategy, diverse procrastination manifestations, a plurality of procrastination motivations, or a lack of simple and precise criteria to identify people with a higher or lower procrastination risk and the corresponding actions from the teacher (Steel & Klingsieck, 2016). The present study is therefore oriented towards early identification of students with procrastinating tendencies.

3. Methodology

3.1. Participants

The study sample was composed of 159 women and 200 men, with ages ranging from 18 to 30 years ($M = 20.57$; $SD = 2.498$). This cohort of 359 students represented 84.6% of the student body at a university business school located in the city of Terrassa (Barcelona, Spain), which has two different university major programs (both are four-year programs): Business Administration and Management (ADE) and Marketing and Digital Communication (MKT). The remaining 15.4% consisted of 9 women and 54 men ($n = 63$) whose surveys presented form defects in fulfillment, ruling out their consideration in the study.

The intentional selection of a single study center arose from the need for access to almost the entire student body in their studies and courses while gathering data, as well as on minimizing, at least potentially, the effect of variables from beyond the study on variance in the studied constructs.

3.2. Measurements

We used the Pure Procrastination scale (hereinafter PP —Steel, 2010), following the translated and validated version from Díaz Morales, Ferrari, Díaz and Argumedo (2006), which incorporates the *General Procrastination Scale* (GP; Lay, 1986), the *Decisional Procrastination Questionnaire* (DP; Mann, 1982), and the *Adult Inventory of Procrastination* (AIP; McCown and Johnson, 1989). The PP12 scale has 12 items with Likert-type responses using five answer choices ranging from 1 —“does not describe me at all”— to 5 —“very characteristic of me”). The Cronbach's α for this study was .907 (compared to .92 in its original application). Studies with the PP scale in an academic context have shown the sensitivity of this instrument to measure procrastination in university settings (Codina, Valenzuela, Pestana & González-Conde, 2018), supporting its use in this study.

Apart from applying this instrument, data were recorded concerning sex, age, entry grades, major (ADE, MKT) and students' year (first to fourth).

3.3. Procedure

This study followed the requirements of the Bioethics Committee at Universidad de Barcelona (CBUB, IRB00003099), with no need for further approval given that the data obtained did not require clinical or animal experimentation. This study also fulfills the recommendations of the General Psychology Council of Spain, the

Spanish Organic Law on Data Protection (15/1999: Jefatura del Estado, 1999) and the Helsinki Declaration (World Medical Association, 2013).

Students answered the surveys in their respective classrooms under supervision from research team members, one month after classes began and 15 days before the exam period, in order to avoid external variables influencing the data (i.e. extra academic work, tiredness, absenteeism) (Dewitte & Schouwenburg, 2002). Student response time was 10-15 minutes. To analyze the data we obtained, we used the SPSS 24 program. Survey scores were calculated in line with previous studies on similar samples (Codina et al., 2018).

To identify underlying variables or factors explaining the configuration of correlations within the set of questions in the PP scale, an exploratory factorial analysis was carried out on it. A principal component analysis was done with Varimax normalization, and came out with a Kaise-Meyer-Olkin test result of 0.867 with a Chi-squared of 754.227 and a lesser significance level of .05.

4. Results

Based on the factorial analysis done, and as we can see in Table 1, one question was deleted (GP1) since it did not fit with one factor, but rather comprised a second individual factor. All other questions (11) or variables observed were above .493 and in only one factor. After these results, the suitability of the PP scale is specified (hereinafter and to distinguish it from the original, PP11) to measure procrastinating behaviors in university students.

Scale items	Median	Standard dev	Factorial load
DP4. I delay my decisions so much that by the time I decide, it's already too late	2.23	1.061	0.713
AIP5. I don't have things done on time.	2.32	1.091	0.703
AIP10. I wind up running when there's no time left	2.84	1.205	0.673
AIP15. During the last year, leaving things until the last minute has cost me money.	2.13	1.206	0.641
GP19. I'm constantly saying: "I'll do it tomorrow".	2.86	1.096	0.630
GP7. I take several days to do tasks, even those where I just have to sit down and do them.	2.89	1.112	0.626
GP12. While working on a project I have to present, I often waste time doing other things	3.17	1.129	0.578
AIP9. I'm not very good during meetings on fixed dates.	2.25	1.085	0.548
GP9. I generally take time to start the work I have to do.	3.06	1.108	0.519
DP1. I lose a lot of time in unimportant details before making the final decision.	3.02	1.137	0.570
DP2. Even after making a decision, I take longer to carry it out.	2.89	1.019	0.493

Table 1. Descriptive statistics and exploratory factorial analysis (factorial loads) on the PP11 scale

To analyze the normality of the data which will be used in the hypothesis test analyses, we applied the Kolmogorov-Smirnov test for samples with more than 50 data points from the dependent variable (PP11: Table 2).

	Statistical	g1	p
PP11	.059	359	.004

Table 2. Normality test

The results indicated that the PP11 variable did not have a normal distribution. We thus used non-parametric tests to prove the hypotheses (Table 3).

	Sex	N	Average range	Sum of ranges
Pure Procrastination	Men	200	190.66	38132.50
	Women	159	166.59	26487.50

Table 3. Comparison of PP11 means, by sex

To test Hypothesis 1, we used the Mann-Whitney U test, whose result was 13767.500 with a p-value of .29 less than .05. This indicates that there are differences between the PP11 mean for men and women. Since the average range for men is greater than for women, PP is greater in men than in women. This lets us accept H1, establishing that procrastination is greater among men than women.

To test H2, we analyzed bivariate correlations. The Spearman's Rho correlation coefficient, which quantifies the intensity of the linear relation between age and PP11, was $-.175$ with a significance below .05, showing an inverse relation between PP11 and age. This confirms Hypothesis 2, namely, that younger students procrastinate more than older students.

To answer H3, the variable for the students' year level must be related with PP11. To analyze the relation between Year Level and PP11, we used the Kruskal-Wallis H test. The results appear in Table 4. As we can see, there is no significant difference in the PP11 mean by year, which means that this hypothesis is rejected.

	Year 1	Year 2	Year 3	Year 4	H	p
	Mean (range)	Mean (range)	Mean (range)	Mean (range)		
PP11	2.81 (3.55)	2.81 (3.27)	2.64 (3.27)	2.55 (2.52)	4.880	.181

Table 4. PP11 comparison by year

When considering grades at admission, we have seen that both variables do not have a normal distribution. We must thus use non-parametric tests, such as Spearman's Rho. The results are as follows: the Spearman's ρ which measures the correlation between PP11 and grades at intake has a value of -0.755 , with a significance of .001. This shows a high negative correlation, meaning that we can conclude the grades which students have upon entering university are a variable which negatively correlates with procrastinating behavior. H4 is proven.

For the major which students study, as previously mentioned, two options exist. We can therefore use the Mann-Whitney U test, which has a value of 15.343 and a bilateral asymptotic significance of 0.779. This indicates a lack of significant differences for procrastinating behavior between the ADE and MKT programs. This hypothesis is rejected.

In summary, the results obtained with the five hypotheses appear in Table 5. Our takeaway here is that to define a construct including the variables related with academic procrastination, we can consider age, gender and grades upon university admissions, ruling out the variables of university major and year. The year is ruled out because procrastination differences are not significant, while for the major, procrastinating behavior is similar in both cases.

Hypothesis	Statement	Accepted or rejected
H ₁	Procrastinating behavior is dependent on sex, and is more frequent among men than women.	Accepted
H ₂	Younger students procrastinate more than older ones.	Accepted
H ₃	Procrastinating behavior depends on the students' academic level; it starts high in the first year, and decreases as they continue through their studies.	Rejected
H ₄	Students with lower grades upon entering university tend to procrastinate more than those with higher entrance grades.	Accepted
H ₅	Students in the Business Administration major have more procrastinating behavior than students in the Digital Communication and Marketing major.	Rejected

Table 5. Hypothesis testing analysis summary

Based on these findings, we performed a multiple linear regression analysis with the variables sex, age, and entrance grades as independent variables, and academic procrastination as a dependent variable. Although the analyzed variables do not fulfill the normality assumption, they do fulfill the other assumptions to use parametric tests; i.e., the sample belongs to independent observations and the dependent variable is at least ordinal.

The regression equation was statistically significant, with $F= 5.442 (3.312)$, $P < 0.01$. The Durbin-Watson test, which ensures the error independence assumption, is also fulfilled since the value is 1.023, placing its value between 1 and 3. For the regression model coefficients, the t-scores indicated that the variables considered contribute significantly to determination of Procrastination, indicating that the values obtained can be generalized to the population. The Inflated Variance Factor also indicates compliance with the non-multicollinearity assumption, since the values lie between 1.020 and 1.046. All values are near 1.

Finally, the multiple regression equation would be:

$$PP = 4.175 - 0.033X_1 - 0.117X_2 - 1.018X_3 + e$$

Where:

PP: PURE PROCRASTINATION

X1: Sex, X2: Age, X3: Admission Grades

To analyze whether the regression fits the real data, we compared the regression results with the PP11 mean, whose analysis appears in Table 6.

		Mean	N	Standard deviation	Mean standard error
Par 1	PP11	2.6481	359	.67429	.04187
	Regression	2.6809	312	.16408	.01035

Table 6. Comparison between mean procrastination and multivariate regression

As we can see, the regression deviates by 0.0084 from the real mean value. We can thus establish that the regression line fits well with real procrastination values. Using this multivariate regression line with the data for age, sex, and entry grades, we can determine students' procrastinating behavior.

Considering the number of students, the PP11 was calculated from the total number of students surveyed. The difference with the multiple linear regression occurred because there were 49 students who did not have their University entry grades. This happened because of special cases such as file transfers from another University, special entries for students over 25, or other special situations.

The minimum and maximum multiple regression values are 1.78 and 2.95 respectively, and the mean is 2.7. Therefore, if the regression value for a student is above 2.7, they should be a pre-candidate to an initial program which can help them avoid, or at least decrease, any academic procrastination. If the value is below 2.7 points, the student can opt out of any such program.

5. Discussion

The problems caused by procrastination have generated an important body of studies aspiring to offer solutions, in terms of intervention strategies as well as defining variables to help anticipate the consequences of students' procrastinating behavior. The results of the present study fall within the latter tendency, namely predicting academic procrastination, by contributing a multiple regression analysis whose results are promising for detecting procrastination levels among university freshmen. The regression carried out contributes a differential matter related to prior studies: it was carried out based on variables present at the moment of entering university, a vital transition which can stimulate the appearance (or increase, as the case may be) of procrastinating behavior. Noticing this trend in time can aid student performance in higher education and, by extension, in their future job performance.

Proving procrastination variations by sex, with a higher presence in men than in women, corroborates the results from Balkis and Duru (2009), Chan (2011), and Mejía et al. (2018). For age, the higher procrastination observed in students up to age 20 aligns with prior findings by Blouin-Hudon & Pychyl (2015), Steel (2007), and van Eerde (2003). Unlike the findings of Clariana et al. (2012), the present study found no significant differences in procrastination by academic year (which was observed by Rodríguez & Clariana, 2017). Thus, in our case, procrastination levels continued without greater variations by study year, showing small decreases that were insignificant on average.

Finally, we should highlight that university entry grades are effectively a predictor of student procrastination; i.e., students who enter with low grades procrastinate more than those who enter university with higher grades. This aligns with the observations of Clariana et al. (2012). In summary, the approximate profile of a procrastinating student is a male under 20 years old who came to university with lower grades, i.e., between 50% and 60% achievement in this qualification.

Being able to predict procrastination (based on sex, age, and entry grades) makes multiple regression a promising analytical procedure for future procrastination research. It could complement, and go beyond, the results which can be offered by descriptive or correlational studies. This could be particularly useful via adding motivational variables, time management habits, and self-regulation or self-determination processes (Codina, Castillo, Pestana & Balaguer, 2020; Grunschel et al., 2018; Kadzikowska-Wrzosek, 2018). We should also consider the negative impact on procrastination from a pro-autonomy teaching style (Valenzuela, Codina, Castillo & Pestana, 2020) or practicing systematic or regular activities (academic, extra-curricular, and leisure: Codina, Pestana, Valenzuela & Giménez, 2020; Gortner & Zulauf, 2000; Pehlivan, 2013; Pestana et al., 2020).

This study thus constitutes a promising contribution, given its integration of variables into a single predictive model, which can be tested for early detection of potential procrastinating behaviors among students entering university. Based on our results, male students under 20 with low grades upon entry appear as a target for special attention, particularly for tutoring and follow-up on new students. We should add to this that, as more variables are added to this procrastination prediction when entering university and following this moment, a closer and more precise assessment of at-risk students can be achieved, along with the best strategies to face procrastination in the classroom. It should be warned that the effects of procrastination on academic performance may be mediated by other psychological and academic variables, such as the grade weight of homework, course length, course relevance to professional life, stress, and self-effectiveness (Schraw, Wadkins & Olafson, 2007; Tan et al., 2008). This matter, however, is still under study, and in this article it has not been analyzed, given that we sought a first integrated indicator for possible future procrastinating behavior upon entering university.

6. Conclusions

Procrastination is a problem faced by teachers. Given this situation, the present study offers a multiple regression model demonstrating that procrastination is more common among males under 20 years old who enter university with lower marks (under 60%). These three analyzed independent variables, if known at the time of university entry, can give us information about students' future procrastinating behavior. At this point, more research is needed to seek other factors which can change during university studies, such as stress level, self-esteem, teamwork skills, effective time management, activity planning, and learning self-regulation. Some of these are considered in the proposed regression model.

The incipient, promising findings of the present study do not obviate the limitations of this research. Having access to almost the entire student body of one university institution created a series of advantages (already discussed before) which do not remove the generalization problems for our findings. To this end, future studies with larger, more diverse samples can contribute to increasing the explanatory potential and number of successful predictions as to whether students may have a future procrastination problem worth nipping in the bud.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received REDICE16-1320 financial support from the Institut de Ciències de l'Educació de la Universitat de Barcelona.

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