



# Structural Relationships Between Procrastination, Academic Motivation, and Academic Achievement Within University Students: A Self-determination Theory Approach

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## Abstract

This study aimed to analyze the influence of academic motivation on procrastination and, in turn, to examine the impact of procrastination on academic achievement, on the grounds of self-determination theory. Undergraduate students (N=928) completed a sociodemographic and academic survey, the Tuckman Procrastination Scale, and the Academic Motivation Scale. Path-analysis findings revealed procrastination was negatively and significantly predicted by intrinsic motivation toward stimulating experiences, intrinsic motivation towards achievement, and extrinsic motivation external regulation. Further, procrastination was positively predicted by intrinsic motivation to know, extrinsic motivation identified regulation, extrinsic motivation introjected regulation, and amotivation. In turn, procrastination negatively predicted academic achievement. Overall, combining components of motivational interventions could aid in tailoring higher education interventions that seek to decrease procrastination and reduce the impact of this variable on academic achievement. Discussion of findings continues in light of previous literature concerning the relationship between motivation and procrastination.

**Keywords** Procrastination · Academic Motivation · Academic Achievement · Self-Determination Theory · Undergraduates

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## Introduction

The study of psychological non-cognitive constructs and their impact on academic outcomes are relevant to improving learning quality within higher education environments. The former are generally open to change through intervention (Duckworth & Yeager, 2015; Lee & Shute, 2010) instead of more environmental factors (i.e., family socioeconomic status; Lee & Stankov 2018). Of these constructs, student engagement and motivational dimensions can be considered the most impactful on higher education achievement (Hattie, 2008), from which both the constructs of procrastination and academic motivation form part.

It has been long asserted that the link between motivational variables and procrastination has a notable impact on higher education (Senecal et al., 1995). However, little research has empirically explored the influence of motivation on procrastination, including academic achievement as a relevant outcome variable. Of important note, several reports have suggested that motivation impacts procrastination, which would negatively affect the students' performance (e.g., Klassen et al., 2008; Lindt et al., 2014; Schraw et al., 2007). Nevertheless, the specifics of these sequential relations have not been thoroughly tested within a self-determination theory framework.

Moreover, numerous references have been made to the relevance of conducting more research on the link between these variables (Katz et al., 2014; Klassen et al., 2010; Rebetez et al., 2015), particularly outside the United States-European domain (Kim & Seo, 2015). This would provide a comprehensive setting to study dilatory behaviors' impact on achievement (Dunn, 2014; Yurtseven & Dogan, 2019).

Furthermore, motivation and procrastination constitute malleable features (Dunn, 2014), open to intervention (van Eerde & Klingsieck, 2018). In this line, several reports have alluded to the benefit of enhancing academic performance through motivational interventions (Hulleman et al., 2016). For instance, improving undergraduates' perceptions of the relevance of their studies to their lives (i.e., intrinsic motivation-related variables) led to an increase in performance (e.g., Harackiewicz et al., 2016; Hulleman et al., 2007; Hulleman et al., 2010). On a similar note, enhancing students' perception of autonomous choice over in-class tasks positively impacted their achievement (Vansteenkiste et al., 2004). Further, a behavioral intervention focused on improving achievement motivation by introducing regular study patterns and simplifying long-term objectives reduced academic procrastination (Tuckman & Schouwenburg, 2004). Likewise, promoting self-regulation via time-management and self-motivation also aided procrastinating undergraduates (Grunschel et al., 2018). In sum, analyzing the academic motivation and procrastination link through more comprehensive models will provide information useful to refine interventions aimed at reducing the impact of procrastination on achievement (Cao, 2012; Cerino, 2014). They may also prevent the consolidation of habitual procrastination (Katz et al., 2014).

## Procrastination

Procrastination research has produced almost as many construct definitions as the number of researchers studying it (Steel, 2007). However, recent works have converged on defining it as the tendency to voluntarily delay work even at the expense of being worse off for the delay (Steel, 2007, 2010; Tuckman, 1991), with particularly adverse outcomes for students in both academic performance and psychological distress (e.g., Kim & Seo 2015; Stöber & Joormann, 2001; Van Eerde, 2003).

Relevantly, procrastination is a widely prevalent phenomenon. Reports place at least half of the student population frequently engaging in this behavioral pattern (Ferrari et al., 2009; Solomon & Rothblum, 1984). It has also been suggested that the evolution of technological temptations will continue to increase its occurrence (Cerino, 2014), and more so within educational settings (Reinecke & Hofmann, 2016). This growth could be emphasized in recent times, where the forceful implementation of online virtual settings provides more procrastinatory temptations and may worsen academic achievement levels (Mahdy, 2020; Pelikan et al., 2021).

Further, procrastination stems from a failure or a lack of self-regulation — defined as the way individuals use internal or external cues to initiate, maintain, or terminate specific actions — (e.g., Haghbin et al., 2012; Klassen & Kuzucu, 2009; Lee, 2005; Steel, 2007; Tuckman, 1998; Tuckman & Sexton, 1989). Procrastination may also be posited as a result of a deficit in motivation (e.g., Haghbin et al., 2012; Klassen et al., 2008; Klingsieck et al., 2013; Senecal et al., 1995; Yurtseven & Dogan, 2019). Thus, an increased comprehension of the link between procrastination and motivation would result in a more precise depiction of the role of both constructs within the higher education environment (Rakes & Dunn, 2010).

## Academic Motivation: Self-determination Theory

Self-determination theory distinguishes between intrinsic and extrinsic motivation within a self-regulation framework. It states different self-regulation behaviors deployed in a continuum with varying degrees of self-control. More self-regulated actions prove more adaptive than less self-determined ones (Deci & Ryan, 1991, 2013). In general terms, these can be classified into three broader categories. Firstly, Amotivation reflects the absence of motivation and perception of lack of control over events, including feelings of incompetence and purposelessness; it is usually positioned at the end of the motivational spectrum, denoting a maladaptive absence of self-determination. Secondly, Extrinsic Motivation (EM) is situated at a middle point in the spectrum, indicating an external goal being chased as the driving behavioral element. Lastly, Intrinsic Motivation (IM) is located at the most self-determined end of the continuum, where activities constitute goals themselves, and the driving factor becomes the individual's own volition.

Regarding motivation within the academic domain, the EM and IM dimensions are further subdivided to reflect differing respective external or internal goals driving the consequent behavior. Regarding EM, it is divided into EM external regulation (EM-external), where behaviors are carried out to avoid punishment or to obtain

completely external rewards; EM introjected regulation (EM-introjected) implies behaviors aimed at either avoiding anxiety and guilt or at improving self-esteem; the last subdimension is EM identified regulation (EM-identified), in which the drive comes through the internal acceptance of the importance of achieving external goals (i.e., societal values on enrolling in higher education). As for IM, three subtypes are specified: IM to know (IM-know), where performing tasks is driven by the pleasure of gaining knowledge; IM towards achievement (IM-achievement), where behaviors are executed for internal achievement purposes such as overcoming one's limitations; IM toward stimulating experiences (IM-SE) refers to tasks performed for aesthetic or intellectual purposes (e.g., Deci & Ryan 2013; Stover et al., 2012; Vallerand et al., 1992).

In this sense, the theory states that autonomous individuals (i.e., displaying higher levels of IM) are more likely to perform tasks diligently than less self-determined ones (i.e., exhibiting higher levels of EM and amotivation; Deci & Ryan 1987; Ryan et al., 1991).

The previous academic motivational variables have been operationalized in the Academic Motivation Scale (Vallerand et al., 1992), and extensive research has been conducted within higher education with it. The scale has been adapted and employed in numerous countries and constitutes one of the leading academic motivation assessment instruments (e.g., Cokley et al., 2001; Fairchild et al., 2005; Stover et al., 2012). This facilitates the analysis of motivational variables according to the full self-determination theory continuum, which will be further developed in the present study.

## Literature Review

A weakened sense of autonomy has been posited to influence behavioral outcomes via undermining intrinsic motivation (Ryan & Deci, 2000). One of these outcomes constitutes avoidance and dilatory behaviors (Haghbin et al., 2012). Empirical research within higher education has stated that, while academic motivation possesses many nuances (Haghbin et al., 2012), learners who employ IM-related strategies to process educational content incur in less procrastination and vice-versa (e.g., Burnam et al., 2014; Cavusoglu & Karatas, 2015; Cerino, 2014). Thus, procrastination has been negatively linked to IM and more self-determined types of EM and positively to less self-determined motivational subtypes (e.g., Borsato, 2001; Brownlow & Reasinger, 2000; Lee, 2005; Rakes & Dunn, 2010).

As early as Senecal et al. (1995), reports posited and tested self-determination motivational variables as explaining procrastination in higher education. Studies have furtherly replicated these findings; in general, low motivational levels across types—and, mainly, the absence of motivation—have been found as robust predictors of procrastination (e.g., Brownlow & Reasinger, 2000; Cavusoglu & Karatas, 2015; Cerino, 2014; Lee, 2005; Rakes & Dunn, 2010). Although, a finer look at empirical studies reveals inconclusive findings (Rebetez et al., 2015).

Primarily, students reporting lower levels of IM were prone to incur in dilatory behaviors (Brownlow & Reasinger, 2000; Lee, 2005). Moreover, Cerino (2014) reported that procrastination exhibited medium to large negative correlations with

IM-related variables and EM-introjected, while a large positive correlation with amotivation. Further analyses revealed that amotivation was the strongest predictor of procrastination. EM-identified and EM-external dimensions were not significantly correlated with procrastination, and EM-external was not a significant predictor of procrastination. Interestingly, IM-know was negatively associated with procrastination but constituted a positive predictor of the latter in regression analyses. These elements may be considered an effect of suppression, also noted by Senecal et al., (1995) regarding EM-identified (i.e., the emergence of a theoretically-inverse relation with procrastination when partialling-out motivational variables covariances).

Furthermore, Chang (2014) found that both IM and EM were significant predictors of procrastination, with the former motivational subtype exhibiting a negative link and the latter a positive one. On this line, Burnam et al. (2014) reported self-determined motivation as a negative predictor of procrastination. Additionally, Rebetz et al., (2015) observed procrastination to be only strongly and negatively associated with EM-identified, along with the absence of significant associations with the remaining motivational variables. It was argued that only EM could distinguish between procrastinatory types. Besides, Yurtseven and Dogan (2019) found procrastination directly predicted by amotivation, yet not by EM/IM. Lastly, there have also been reports of no significant associations whatsoever between procrastination and motivation within the educational domain (Şirin, 2011; Yun, 2019).

## Objectives and Hypotheses

This study sought to analyze the influence of academic motivation on procrastination. Further, it aimed to examine whether procrastination proves a robust predictor of academic achievement from a self-determination theory perspective. The research plan was guided by the following questions: (a) Can self-determination theory academic motivation be implemented to explain academic procrastination and its subsequent impact on academic achievement? (b) How does the self-determination theory academic motivation spectrum explain academic procrastination? (c) How do procrastinatory behaviors subsequently impact academic achievement? As such, it was hypothesized:

- (H1a): More self-determined motivational subtypes (i.e., IM) will constitute negative predictors of procrastination.
- (H1b): Least self-determined subtypes (i.e., EM and amotivation) will predict procrastination positively.
- (H2): Procrastination will predict academic achievement negatively.

## Method

### Design

A cross-sectional and explanatory study design was run. Participants were recruited through a convenience sampling strategy. Individuals were contacted through social media student groups on Facebook, Telegram, and WhatsApp, where a link to an online survey was provided. These groups were selected because Argentinian university-level students frequently communicate within these channels and on these social media platforms to share academic and nonacademic content and interact socially. Moreover, teachers also use these platforms to maintain communication with students, so active participation from the undergraduate community is assured. Another reason for employing these groups is the possibility of accessing students of the public university system of the entire Buenos Aires city and environs region, thus lending increased generalizability to any potential findings. Finally, individuals gave informed consent to participate. They were briefed about the study purposes, the confidentiality of the data provided and the possibility of desisting at any point of the procedure. The briefing was performed in a written manner, where participants could express consent to the conveyed information and agree to participate in the study. No compensation was offered in exchange.

### Participants

Participants were 928 undergraduates currently attending public universities from Buenos Aires City and environs, in Argentina ( $M_{\text{age}} = 26.93$ ,  $SD_{\text{age}} = 8.01$ ; 78.9% female, 20.5% male, 0.6% non-binary). Individuals were recruited from 16 universities with similar organizational patterns regarding institutional and academic curricular content for respective majors. Such institutions comprise the public university network of the Buenos Aires urban environment. Recruited participants were registered as studying in one of five main categories of majors according to an Argentinian higher education official classification —Engineering and Technology: 21.36%, Social Sciences: 49.62%, Medical Sciences: 14.13%, Human Sciences: 9.27%, Math and Natural Sciences: 5.61%— (Argentinian Ministry of Education, 2015).

### Instruments

The participants' survey included the following sections and psychological instruments:

*Sociodemographic and academic survey.* Participants indicated their age, gender, and academic background. Self-reported GPA (on a scale from 1 to 10, the official grading system in Argentina) was employed to measure academic achievement ( $M=7.55$ ,  $SD=1.00$ ).

*Tuckman Procrastination Scale* (Tisocco & Fernández Liporace, 2021; Tuckman, 1991). This scale assesses procrastination, defined as a measure of the “tendency to delay or put off doing things” (Tuckman, 1991, p. 475) due to a failure in self-regulation. It has been widely used to measure procrastination in educational research (Kim

& Seo, 2015; McCloskey, 2011). Moreover, the Argentinian adaptation has exhibited satisfactory validity evidence and excellent internal consistency (e.g., Furlan et al., 2014; Furlan et al., 2012; Tisocco & Fernández Liporace, 2021). It possesses 15 items with a 5-point Likert frequency scale —*Never (1) to Always (5)*.

*Academic Motivation Scale* (Stover et al., 2012; Vallerand et al., 1992). It employs 27 items that exhibit possible reasons for students to attend university, responded by a 4-point Likert scale ranging from *Completely Disagree (1) to Completely Agree (4)*. According to self-determination theory, items are grouped into seven subscales indicating motivational subtypes depicted in the [Introduction](#) section, namely Amotivation, EM-external, EM-introjected, EM-identified, IM-know, IM-achievement, and IM-SE. Additionally, the Argentinian adaptation of the scale has shown satisfactory validity and reliability evidence (e.g., Stover et al., 2012; Stover et al., 2015). As a supplementary analysis, a Confirmatory Factor Analysis of the hypothesized structure of the scale was carried out, and the scale's measurement model exhibited acceptable fit (CFI=0.919, TLI=0.907, RMSEA=0.071, SRMR=0.078; Marsh et al., 2004; Schumacker & Lomax, 2015).

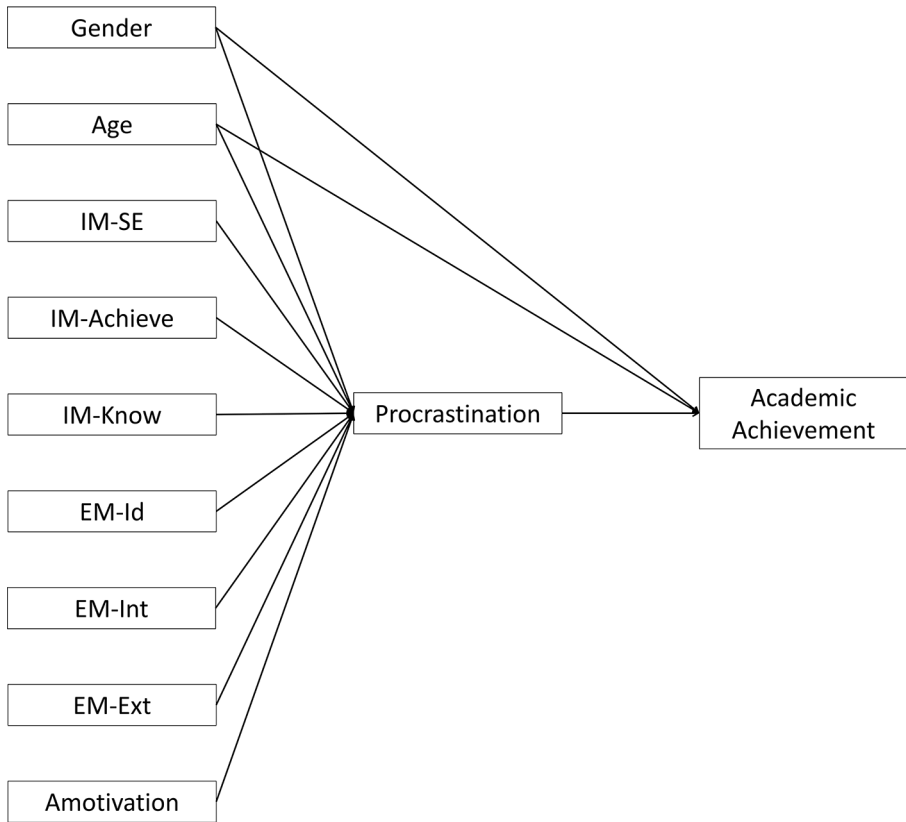
### Procedure: Theoretical Framework

A predictive model of academic achievement was formulated. Within it, academic achievement was predicted by procrastination and procrastination was subsequently predicted by the motivational variables. This model was based on literature reports regarding the predictive functioning of motivational variables on procrastination (e.g., Brownlow & Reasinger 2000; Burnam et al., 2014; Cerino, 2014; Chang, 2014; Dunn, 2014; Katz et al., 2014; Klassen et al., 2010; Klassen & Kuzucu, 2009; Lee, 2005; Senecal et al., 1995; Serhatoğlu, 2018; Yurtseven & Dogan, 2019) as well as the influence of procrastination on academic achievement (e.g., Akpur 2017; Kim & Seo, 2015; Steel, 2007; Van Eerde, 2003). According to self-determination theory and as assessed by the Academic Motivation Scale, the seven academic motivational subdimensions were included. Moreover, to control for age and gender, these variables were included in the model as covariates to the motivational variables and exogenous predictors of procrastination and academic achievement (Mueller & Hancock, 2018). The proposed model is depicted in Fig. 1.

### Procedure: Data Analysis

Following, to test the data's fit to the conceptual model, Structural Equation Modelling (SEM) was carried out in a path analysis manner by incorporating multiple sequential predictors as observed variables in one single model; this allowed to examine relationships between multiple variables and test the model depicted in Fig. 1 (Schumacker & Lomax, 2015). SEM was selected as the most comprehensive and accurate method to examine the predictive role of academic motivation and procrastination instead of a simple multiple regression approach; this also allows for an estimation method selection that better represents the data distribution (Kline, 2015).

On a relevant note, the model's outcome variable (GPA) could potentially vary across academic majors. It could thus lead to bias in the estimation of the model



**Fig. 1** Proposed Model —includes covariances between gender, age and Academic Motivation variables

(despite being measured on the same scale from 1 to 10, GPA could differ across majors, which could have varied curricula and grading practices). To address this, a multilevel structure was implemented within the model in which academic achievement was allowed to vary across categories of majors to account for this potential data clustering effect (2-level random-effects model). This aids in correcting the model's standard errors, leading to increased accuracy of the estimations (Kline, 2015). Importantly, due to model convergence issues, data could not be analyzed by modeling GPA-clustering across institutions or individualized majors. Interpretation of further results must be considered in light of this limitation.

To further examine the best estimation method for testing the model, multivariate and univariate normality assumptions were analyzed, which were not supported due to a high Mardia's multivariate kurtosis coefficient ( $G2=27.49$ ,  $p<.001$ ,  $G2>5.0$ ; Bentler & Wu, 2005), as well as high univariate skewness ( $>2$ ) and kurtosis values in the case of amotivation ( $>7$ ; West et al., 1996). Thus, the model was estimated through a Robust Maximum Likelihood (MLR) estimator (Li, 2016). Several fit indices were computed to assess the model fit to data, namely Satorra-Bentler-Scaled  $\chi^2$ , CFI, TLI, RMSEA, and SRMR. The Intraclass Correlation Coefficient (ICC) of



academic achievement was calculated to assess the variance accounted for in GPA by major category clustering. Analyses were performed with R-packages *lavaan* (Rosseel, 2012) and *psych* (Revelle, 2017).

## Results

As preliminary analyses, Table 1 exhibits the bivariate correlation (Pearson's  $r$ ) coefficients between the variables included in the study, means and standard deviations, and internal consistency ordinal- $\alpha$  coefficients (Gadernann et al., 2012).

The proposed model exhibited an excellent fit to data as per examined indices ( $\chi^2(8)=16.93$ ,  $p=.031$ ; CFI=0.998, TLI=0.996, RMSEA=0.028 [0.000, 0.046], SRMR=0.010; Marsh et al., 2004). Further, major groups accounted for 6.5% of the variance in GPA (ICC=0.065), thus evidencing data clustering according to the type of curricula. This supports adopting a multilevel model to correct for standard errors since dependency between observations was detected (Snijders & Bosker, 2011).

The model's parameter estimates are detailed in Table 2 and depicted in Fig. 2. Procrastination was predicted negatively and significantly by IM-SE ( $\beta = -0.19$ ,  $p < .001$ ), IM-achievement ( $\beta = -0.15$ ,  $p = .021$ ) and EM-external ( $\beta = -0.10$ ,  $p < .001$ )—students with IM-SE, IM-achievement and EM-external motivational profiles exhibit lower procrastination levels—. In turn, procrastination was positively and significantly predicted by IM-know ( $\beta = 0.13$ ,  $p = .027$ ), EM-identified ( $\beta = 0.09$ ,  $p = .005$ ), EM-introjected ( $\beta = 0.16$ ,  $p = .005$ ), and amotivation ( $\beta = 0.16$ ,  $p = .002$ ); it appears that the least self-determined end of the spectrum as well as IM-know contribute to a rise in procrastination behaviors. Lastly, procrastination negatively and significantly predicted academic achievement ( $\beta = -0.21$ ,  $p < .001$ ); individuals with higher procrastination scores showed a lower performance. For clarity purposes, estimated paths and covariances for the full model (i.e., including control variables) are not depicted in the tables; full information regarding the paths and covariances within the model can be found in the Appendix.

## Discussion

This study attempted to increase the knowledge on the relations between motivation, procrastination and academic achievement, stemming from reports linking motivation and procrastination in higher education. The proposed model exhibited an excellent fit to the data. Further, employing a multilevel model structure to account for significant GPA clustering across categories of majors and controlling for both age and gender rendered an increased accuracy of the estimates and provided robustness to the results. Generally, the more self-determined motivational subtypes account for lower procrastinatory inclinations. In contrast, maladaptive motivation types contribute to an increase in procrastination, with procrastination then accounting for a reduction in undergraduate achievement. Exceptions to this are the IM-know and EM-external motivational subtypes.

**Table 1** Pearson's r correlation coefficients between variables and internal consistency coefficients.

	Procrastination	IM-SE	IM-achievement	IM-know	EM-identified	EM-introjected	EM-external	Amotivation	Academic Achievement	Age	Gender <sup>a</sup>
Procrastination	$\alpha=0.91$										
IM-SE	-0.208 ( $<0.001$ )	$\alpha=0.76$									
IM-achievement	-0.168 ( $<0.001$ )	0.566 ( $<0.001$ )	$\alpha=0.87$								
IM-know	-0.117 ( $<0.001$ )	0.633 ( $<0.001$ )	0.676 ( $<0.001$ )	$\alpha=0.90$							
EM-identified	0.004 (0.897)	0.177 ( $<0.001$ )	0.408 ( $<0.001$ )	0.297 ( $<0.001$ )	$\alpha=0.76$						
EM-introjected	0.122 ( $<0.001$ )	0.089 (0.007)	0.313 ( $<0.001$ )	0.096 (0.003)	0.457 ( $<0.001$ )	$\alpha=0.77$					
EM-external	0.019 (0.569)	-0.036 (0.273)	0.213 ( $<0.001$ )	0.055 (0.094)	0.668 ( $<0.001$ )	0.529 ( $<0.001$ )	$\alpha=0.85$				
Amotivation	0.205 ( $<0.001$ )	-0.237 ( $<0.001$ )	-0.327 ( $<0.001$ )	-0.367 ( $<0.001$ )	-0.226 ( $<0.001$ )	0.137 ( $<0.001$ )	-0.042 (0.199)	$\alpha=0.93$			
Academic Achievement	-0.177 ( $<0.001$ )	0.075 (0.023)	0.021 (0.513)	0.054 (0.098)	-0.025 (0.447)	0.032 (0.329)	-0.039 (0.230)	-0.038 (0.243)	-		
Age	-0.130 ( $<0.001$ )	0.136 ( $<0.001$ )	0.116 ( $<0.001$ )	0.053 (0.107)	-0.109 (0.001)	-0.159 ( $<0.001$ )	-0.129 ( $<0.001$ )	0.008 (0.814)	-0.009 (0.786)	-	
Gender <sup>a</sup>	-0.014 (0.661)	0.128 ( $<0.001$ )	0.200 ( $<0.001$ )	0.149 ( $<0.001$ )	0.173 ( $<0.001$ )	0.067 (0.041)	0.066 (0.046)	-0.079 (0.017)	0.027 (0.420)	0.044 (0.177)	-
<b>M</b>	42.10	11.17	12.93	14.08	12.70	8.48	8.91	4.84	7.55	26.93	-
<b>SD</b>	10.89	2.75	2.94	2.39	2.67	3.16	2.63	1.82	1.00	8.01	-

Pearson's r coefficients displayed as upper values; respective p-values displayed between parentheses. Ordinal- $\alpha$  coefficients on diagonal.

<sup>a</sup>0= male; 1= female.

**Table 2** Model parameter estimates of academic motivation variables, procrastination, and academic achievement (controlling for age and gender)

Predictor	DV	Std. Parameter Estimate	SE	<i>z</i>	<i>p</i>	Lower 95% CI	Upper 95% CI
IM-SE	Procrastination	-0.19	0.03	-5.84	<0.001	-0.26	-0.13
IM-achievement	Procrastination	-0.15	0.06	-2.30	0.021	-0.27	-0.02
IM-know	Procrastination	0.13	0.06	2.21	0.027	0.01	0.24
EM-identified	Procrastination	0.09	0.03	2.83	0.005	0.03	0.15
EM-introjected	Procrastination	0.16	0.06	2.81	0.005	0.05	0.27
EM-external	Procrastination	-0.10	0.02	-4.40	<0.001	-0.15	-0.06
Amotivation	Procrastination	0.16	0.05	3.04	0.002	0.06	0.26
Procrastination	Academic Achievement	-0.21	0.02	-11.48	<0.001	-0.25	-0.17

Note: age and gender paths are not depicted in the table for clarity purposes.

DV: Dependent Variable. Std.: Standardized. SE: Standard error. Standard errors and CIs computed using Huber–White robust SE estimation (Lai 2018).

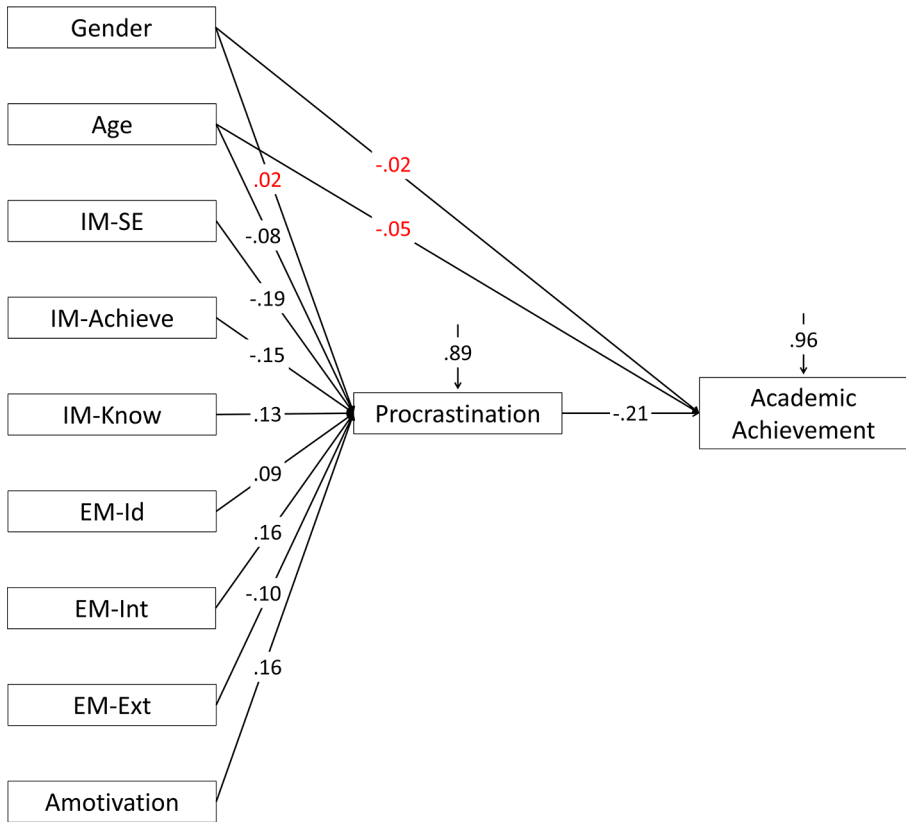
### Intrinsic Academic Motivation and Procrastination

IM-SE and IM-achievement negatively predicted procrastination. These findings point out the role of self-determination as a protective factor against the tendency to incur in problematic dilatory behavioral patterns. Individuals prone to perform tasks for personal aesthetic/abstract/intellectual purposes or pursuing internal purposes such as overcoming one’s limitations may be protected from procrastinatory inclinations. These elements align with prior literature reports (Brownlow & Reasinger, 2000; Burnam et al., 2014; Chang, 2014; Lee, 2005) and provide partial support for H1a. Findings highlight the importance of including self-determination boosting components in interventions that seek to lower procrastinatory behaviors.

Nonetheless, IM-know was a *positive* predictor of procrastinatory inclinations, even when it initially exhibited *negative* bivariate correlations. This aligns with Cerino’s (2014) report, where a statistical suppression effect was observed when examining the IM-know and procrastination link while controlling for other motivational variables. Hypothetically, when adjusting for other self-determined motivational subtypes, the tendency to perform tasks solely due to the pleasure of gaining knowledge may not be beneficial but harmful. This points towards the relevance of addressing academic motivation as an entire continuum within research: it would seem beneficial to account for covariations between motivational subtypes prior to examining the link of motivation with other psychological constructs since not doing so could lead to wrongful conclusions. These elements also support a multifaceted nature of self-regulated academic motivation (Haghbin et al., 2012).

### Extrinsic Academic Motivation, Amotivation, and Procrastination

As for less self-determined motivational subtypes, procrastination was predicted positively by EM-identified, EM-introjected, and amotivation, which rendered partial support to H1b. In this sense, students performing tasks due to an internal decision to



**Fig. 2** Proposed model's estimated paths. Covariances between gender, age and academic motivation variables not depicted. Non-statistically significant paths ( $p > .05$ ) depicted in red. Gender: 0 = male; 1 = Female

pursue external goals, improve self-esteem, avoid anxiety and guilt, and a perception of lack of control over events are at risk of increased procrastination. These findings align in part with several reports (e.g., Chang 2014; Rebetz et al., 2015; Yurtseven & Dogan, 2019). They also follow accounts of procrastination as associated with a motivational deficit and negative emotions such as guilt and anxiety (e.g., Haghbin et al., 2012; Klassen et al., 2008; Klingsieck et al., 2013; Steel, 2007). It would seem that motivational orientations related to emotional avoidance (EM-introjected) prove equivalently maladaptive as the lack of motivation (amotivation) in terms of their impact on academic dilatory behaviors. To a lesser extent, motivation factors involving an internal decision to pursue extrinsic goals (EM-identified) also constitute risk factors for procrastination.

Another interesting finding was that EM-external was a *negative* predictor of procrastination, which resembles the seemingly contradictory observation regarding IM-know. It would appear that behaviors carried out to avoid punishment or get completely external rewards result in lower procrastinatory inclinations when controlling for other motivational subtypes. Possessing entirely external rewards or

punishments could help students prioritize tasks better, therefore incurring in less procrastination since less personal responsibility is required in managing these external contingencies. This outcome involves particular interest, yet more research is needed to probe the relationship between this motivational type and procrastination, particularly when the results contradict previous reports (Cerino, 2014). If these findings were replicable, interventions aiming to act on procrastination could manage external rewards/punishments to complement fostering self-determination.

## Procrastination and Academic Achievement

Procrastination negatively predicted academic achievement. This finding aligns with previous meta-analytical reports, which remark on the negative effect of procrastination on academic outcomes (e.g., Kim & Seo 2015; Steel, 2007); it also supports H2. Thus, according to both theory and reports, postponing academic work at the expense of being worse off for the delay negatively impacts student performance.

## Recommendations for future research

Continuing the study of the structural relationships of relevant psychological variables within higher education settings, another pertinent construct to understand the impact of motivation on procrastination would be perfectionism. It has been previously proposed as a mediator between motivation and procrastination (Burnam et al., 2014) and has enveloped great debate within procrastination research (e.g., Sirois et al., 2017). Additionally, the motivational link of adaptive aspects of dilation such as active procrastination could be examined (Choi & Moran, 2009). Previous reports suggested that motivation might help explain the differences between maladaptive/adaptive procrastination facets (Schraw et al., 2007). Increased comprehension of more paradoxical procrastination components may shed light on this study's seemingly contradicting findings (i.e., the effect of IM-know and EM-external on procrastination). Moreover, procrastination and motivational research with an explicit focus on online environments would be beneficial (Dunn, 2014; Rakes & Dunn, 2010), and more so considering the recent advent of times that demand an increased reliance on virtual education (Mahdy, 2020; Pelikan et al., 2021).

## Limitations and Contributions

The limitations of the study involve, foremost, its cross-sectional nature. While an explanatory design was implemented and a path model was tested (providing an excellent fit to the data), no definitive causal inferences may be made from the current design since no formal temporal precedence of the variables was verified (Schumacker & Lomax, 2015). Thus, the study can be considered a firsthand approach to the role of motivation on procrastination and the subsequent impact of procrastination on achievement. Future research should implement longitudinal designs to test the proposed model while accounting for temporality.

Furthermore, as mentioned in the [Method](#) section, analyzing a multilevel structure of academic achievement in the model allowed to account for variance across catego-

ries of majors, thus estimating the model parameters more accurately (Kline, 2015). However, due to model convergence issues, a multilevel structure allowing the data to be clustered within institutions or individualized majors (or organized within a three-level *institution-major-individual* model structure) could not be implemented. While similarities between colleges in the present work might suggest a similar variance in academic achievement between institutions level, a more thorough analysis of this assertion was not possible. Interpretation of the findings must be carried out with this limitation in mind; future studies should consider using this model structure to assess academic achievement and its potentially varying operationalizations in a more refined manner. Lastly, the current work relied on self-report measures and convenience sampling, which warrant caution while interpreting results despite being commonplace within the literature (Kim & Seo, 2015; Steel, 2007).

In sum, the study sought to analyze the impact of the self-determination spectrum of academic motivation on procrastination and the latter's impact on academic outcomes. Implications of the present results point toward the potential benefits of addressing self-determination-theory motivational variables to reduce procrastination's impact on higher education achievement. The results provided within this study could orient intervention design by referring attention to the strongest motivational predictors of procrastination. Interventions focusing on reducing amotivation, EM-introjected, and IM-know, and the fostering of IM-SE, IM-achievement, and EM-external may prove successful in reducing the negative academic impact of procrastination. In this sense, incrementing choice-perception within classroom curricula (Vansteenkiste et al., 2004) and incorporating self-regulation with self-reinforcement and managing the study environment may appeal to individuals high in IM and EM-external dimensions, thus reducing procrastination and enhancing achievement (Grunschel et al., 2018).

Moreover, to reduce procrastination in students high in amotivation and EM-introjected, a more complete educational intervention could also introduce procedures typically employed in psychotherapy to address feelings of aimlessness, hopelessness, anxiety, and guilt. The intervention could also aim to diminish IM-know by incorporating sessions in which students reflect on the value of pursuing their study goals, thus not only grounding their objectives on the sole pleasure of gaining knowledge. Interventions could include Acceptance and Commitment Therapy contents to reduce amotivation, EM-introjected and IM-know. This approach has proven effective in reducing depressive-like symptoms and works by targeting emotion-avoidance behaviors. It is also grounded in defining and establishing core values within life areas (e.g., Levin et al., 2014; Pistorello et al., 2013).

The present findings also highlight the potential benefits of screening students' academic motivational profiles at the initial stages of procrastination interventions to concentrate more intensely on their different strategies, which act on different motivational components. This may facilitate conducting personalized interventions based on motivational profiles. While considering the limitations mentioned above, it is believed that the study provides an increased understanding of the structural relationships between academic motivation and procrastination in the context of educational outcomes, with hopes that the findings may serve as a guide for both future research and interventions in the field of higher education.

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## Declarations

**Conflict of interest** The authors have no competing interests to declare that are relevant to the content of this article.

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