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Time management and academic procrastination in Vietnamese higher education: parallel mediation by academic motivation and self-regulation

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Abstract

Purpose – Despite growing evidence on the associations among time management, self-regulation, academic motivation, and academic procrastination, limited research has examined these variables within an integrated framework, particularly in non-Western contexts such as Vietnam. Grounded in Self-Determination Theory, Social Cognitive Theory and Self-Regulated Learning Theory, this study aimed to examine the parallel mediating roles of self-regulation and academic motivation in the association between time management and academic procrastination among Vietnamese university students.

Design/methodology/approach – A total of 1,091 students (77.2% female) voluntarily completed measures assessing self-regulation, academic motivation, time management, and academic procrastination. Using a cross-sectional design, data were analyzed using partial least squares structural equation modeling with SmartPLS 3.9, which was selected due to its suitability for testing complex mediation models involving multiple latent constructs, and indirect effects were tested using bootstrapping procedures.

Findings – The findings indicated that both self-regulation ($\beta = -0.097$, $p < 0.01$, 95% CI = [−0.146, −0.031]) and academic motivation ($\beta = -0.111$, $p < 0.01$, 95% CI = [−0.159, −0.062]) significantly and partially mediated the relationship between time management and academic procrastination as parallel mediators.

Originality/value – By simultaneously testing self-regulation and academic motivation as parallel mediators rather than examining them in isolation, this study provides insight into their relative roles in linking time management to academic procrastination in the Vietnamese higher education context, while providing evidence based on associations rather than causal inferences.

Keywords Time management, Academic motivation, Academic procrastination, Self-regulation, Vietnam

Paper type Research article

1. Introduction

Procrastination is a common phenomenon in the educational context (Zacks and Hen, 2018). Academic procrastination (AP) is commonly defined as the tendency to delay completing assigned academic tasks, even though learners are aware that this procrastination can lead to adverse consequences (Zacks and Hen, 2018). Prior research consistently indicates that AP is highly prevalent among university students worldwide, although prevalence rates vary substantially across cultural and educational contexts (Fentaw *et al.*, 2022; Ahmed *et al.*, 2023; Abolahrari-Shirazi *et al.*, 2025). In Vietnam, recent research reports a high prevalence of AP among university students (78%, ranging from sometimes to frequently) (Hồ *et al.*, 2023). Students characterized by high levels of AP are more likely to experience academic underperformance, reduced satisfaction with their learning experiences (Tian *et al.*, 2024), and increased psychological distress (Peixoto *et al.*, 2021). These findings indicate that AP is not merely a common behavior but a significant educational and psychological concern that requires systematic investigation.

Beyond prevalence, a substantial body of research has demonstrated that AP is significantly associated with time management (TM) (Liu *et al.*, 2022; Faure-Carvallo *et al.*, 2025),

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self-regulation (SR) (Lourenço and Paiva, 2024), and students' academic motivation (AM) (Oram and Rogers, 2022; Tisocco and Liporace, 2023). However, despite these established associations, the mechanisms through which these variables jointly influence AP remain insufficiently clarified, particularly in non-Western higher education contexts.

Vietnam represents a theoretically meaningful context for examining these relationships. The Vietnamese higher education system is characterized by high academic pressure, exam-oriented assessment, and learning practices that traditionally emphasize memorization over autonomous learning strategies. These structural and cultural features may shape students' TM, SR, and AM in ways that intensify vulnerability to AP. Therefore, investigating these relationships in Vietnam offers an opportunity to examine whether existing theoretical models operate similarly within a highly exam-driven educational culture. Examining AP in this context, therefore, not only provides important local evidence but also contributes to refining theoretical models by clarifying how educational culture conditions the pathways linking TM, SR, AM, and AP.

2. Literature review

2.1 Time management and academic procrastination

TM refers to the process by which individuals proactively control and allocate their time to engage in goal-directed activities and achieve desired outcomes (Wolters and Brady, 2021). In higher education contexts, TM is considered a critical academic skill, as university students are required to manage increased autonomy, heavier workloads, and competing academic and non-academic demands. Under such conditions, ineffective time use may result in disorganization, increased stress, and reduced academic performance (Ahmady *et al.*, 2021; Wolters and Brady, 2021).

A growing body of research consistently demonstrates a negative association between TM and AP, indicating that students who manage their time more effectively are less likely to delay academic tasks (Wolters *et al.*, 2017; Liu *et al.*, 2022; Faure-Carvallo *et al.*, 2025). From a theoretical perspective, TM can be conceptualized as a foundational self-regulatory skill that enables students to structure academic demands and allocate effort strategically over time (Zimmerman, 1986, 2000; Wolters and Brady, 2021). By providing temporal organization and direction to learning activities, effective TM is expected to support sustained engagement and reduce the likelihood of task postponement (Liu *et al.*, 2022). However, despite robust evidence for this direct association, prior research has largely focused on bivariate relationships, offering limited insight into the underlying psychological mechanisms through which TM reduces AP, particularly in Southeast Asian higher education contexts.

2.2 Self-regulation as a mediator

SR refers to the process through which students proactively monitor, regulate, and direct their learning activities using cognitive and behavioral strategies (Wu *et al.*, 2024). Individuals with high levels of SR tend to set goals, manage resources effectively, and adapt their behavior to meet academic demands (Sahranavard *et al.*, 2018).

TM and SR are closely related, with TM often considered a crucial component of broader self-regulatory capacity (Pintrich and Zusho, 2007; Tao *et al.*, 2025). In self-regulated learning theory, time is viewed as a core dimension that learners can actively control through planning, monitoring, and effort regulation in order to achieve academic goals (Pintrich and Zusho, 2007). Empirical evidence further supports this link, showing that students with higher TM tend to exhibit higher SR, and that TM-based interventions can enhance students' self-regulatory capacity (Lourenço and Paiva, 2024; Saman Azari *et al.*, 2024). These findings suggest that TM is not merely a behavioral skill but represents a foundational mechanism that supports the regulation of learning processes. However, prior research has primarily focused on direct associations or intervention outcomes, with limited attention to SR as a mediating mechanism linking TM to downstream academic behaviors.

At the same time, prior research indicates that higher levels of SR are associated with lower levels of AP, as procrastination is often conceptualized as a failure of SR (Hasyim and Nastiti, 2022; Li *et al.*, 2022; Lourenço and Paiva, 2024). Within the framework of self-regulated learning theory (Zimmerman, 1986, 2000), students with stronger self-regulatory capacities, such as maintaining focus, regulating emotions, and monitoring learning progress, may be less likely to engage in procrastination, particularly when tasks are directly related to important academic goals (Wolters *et al.*, 2017). Taken together, these findings suggest that SR functions as a mechanism through which TM influences AP by shaping how students regulate their learning behaviors in practice. Specifically, SR reflects how students translate time-related skills into sustained, goal-directed academic actions through planning, monitoring, and behavioral adjustment.

2.3 Academic motivation as a mediator

TM plays a significant role in fostering students' AM, with consistent evidence showing positive associations between TM and various forms of motivation across diverse university contexts (Peker, 2024; Fuadi and Almanshur, 2025; Makiah and Nusron, 2025). From the perspective of Social Cognitive Theory (Bandura, 1991) and Self-determination Theory (Deci and Ryan, 1985, 2000), effective TM may enhance students' perceived competence and autonomy, thereby fostering more self-determined forms of motivation. Importantly, in contrast to SR—which reflects how students regulate their learning behaviors—AM captures why students initiate and persist in academic tasks, including perceived task value, intrinsic interest, and goal commitment.

Empirical research further indicates that higher levels of AM are generally associated with lower AP (Oram and Rogers, 2022; Tisocco and Liporace, 2023), particularly when motivation is more autonomous in nature, whereas amotivation is linked to increased AP (Senécal *et al.*, 1995; Vlachopanou *et al.*, 2025). From the perspective of Self-Determination Theory (Deci and Ryan, 1985, 2000), autonomous motivation—grounded in the satisfaction of basic psychological needs for autonomy and competence—promotes sustained engagement and task persistence, whereas controlled motivation or amotivation is associated with disengagement and avoidance behaviors. Recent intervention-based evidence further supports this mechanism, showing that TM strategy training enhances students' AM while simultaneously reducing AP (Asgari *et al.*, 2025). This finding provides preliminary support for a motivational pathway linking TM to AP, whereby effective TM enhances perceived control over learning activities, thereby strengthening motivation to initiate and sustain academic engagement. However, despite this evidence, few studies have examined AM as a mediator within an integrated framework that simultaneously considers other internal processes.

Taken together, SR and AM represent two conceptually distinct yet complementary pathways through which TM may influence AP: a regulatory pathway (how behavior is managed) and a motivational pathway (why behavior is initiated and sustained).

2.4 Gap and research purpose

Although several recent studies have examined the association between TM and AP, most have been conducted in Western or other Asian contexts, including Spain (Faure-Carvallo *et al.*, 2025), China (Liu *et al.*, 2022), and the United States (Wolters *et al.*, 2017), as well as Indonesia (Fuadi and Almanshur, 2025), with limited research in Vietnam. More importantly, prior research has generally examined SR and AM as separate or sequential mechanisms, with relatively limited attention to their simultaneous roles within an integrated framework. It remains unclear whether TM influences AP directly or indirectly through SR and AM, and whether SR and AM operate as simultaneous mediators within a single integrated framework. Furthermore, existing studies have rarely compared the relative contributions of SR and AM in explaining how TM is associated with AP among Vietnamese university students. To address

these gaps, the present study tests an integrated mediation model to examine the joint and comparative mediating roles of SR and AM in the relationship between TM and AP. By examining SR and AM simultaneously within a parallel mediation framework, this study extends prior research that has typically treated these variables separately or examined them in isolation and contributes to a more integrated understanding of the mechanisms underlying AP. This integrated approach not only clarifies the relative explanatory power of regulatory and motivational mechanisms but also provides a more theoretically coherent basis for future intervention-oriented research in higher education.

This study aims to examine the relationship between TM and AP among Vietnamese university students, while exploring the mediating roles of AM and SR in this relationship. Although some studies suggest that SR is associated with AM (Nwikpo *et al*., 2024; Zaben Khawwaf *et al.*, 2024), the two constructs stem from distinct theoretical traditions and represent different psychological processes. Empirical findings regarding their directional association remain mixed and do not converge on a consistent theoretical sequence. Some studies suggest that SR may enhance AM (Zaben Khawwaf *et al.*, 2024), whereas other perspectives propose that AM may facilitate SR (Zheng *et al.*, 2021). From a theoretical perspective, SR and AM reflect distinct yet complementary processes that may operate concurrently rather than in a fixed causal sequence, supporting their conceptualization as parallel mediators. Given this conceptual and empirical variability, specifying a sequential mediation model (e.g. TM → SR → AM → AP or TM → AM → SR → AP) would require stronger theoretical and longitudinal justification. Particularly in a cross-sectional design, assuming a fixed causal order between SR and AM may be premature. Therefore, the present study conceptualizes AM and SR as parallel mediators. Importantly, although both SR and AM can be broadly considered self-management processes, they capture theoretically distinct mechanisms: AM reflects why students engage in academic tasks, whereas SR reflects how they regulate their behaviors to achieve these goals. From this perspective, TM may be associated with AP through two complementary pathways: a motivational pathway (TM → AM → AP) and a regulatory pathway (TM → SR → AP), which operate simultaneously rather than sequentially. This distinction helps reduce conceptual overlap between the mediators and provides a clearer theoretical justification for modeling SR and AM as parallel mediators.

The present study is theoretically grounded primarily in Self-Regulated Learning Theory (Zimmerman, 1986, 2000), Social Cognitive Theory (Bandura, 1991), and Self-Determination Theory (Deci and Ryan, 1985, 2000). Within this integrated perspective, TM is conceptualized as a core self-regulatory skill that strengthens students' broader SR capacities and enhances AM, both of which are expected to be associated with lower levels of AP. This integrated framework conceptualizes SR and AM as distinct yet complementary mechanisms and provides the basis for examining them as parallel mediators in the relationship between TM and AP.

Although AM is inherently multidimensional, the present study conceptualizes it as a global construct to capture students' overall motivational engagement. This approach is theoretically aligned with the study's focus on general motivational processes linking TM and AP, while also allowing for a more parsimonious examination of multiple mediators within a single model.

Based on the above theoretical rationale, the following hypotheses are proposed.

H1. TM is negatively related to AP among Vietnamese university students.

H2. SR mediates the association between TM and AP among Vietnamese university students.

H3. AM mediates the association between TM and AP among Vietnamese university students.

As illustrated in Figure 1, the proposed model suggests that TM is associated with AP both directly and indirectly through two pathways: one through SR and the other through AM. F1

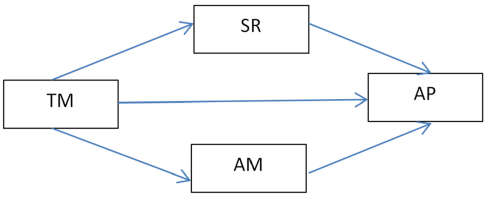

Figure 1. Conceptual model. Source: Authors' own work

While both mechanisms are expected to mediate this relationship, AM may play a relatively more prominent role, given its closer association with task engagement and persistence, whereas SR primarily reflects behavioral control processes.

3. Methods

3.1 Sample and procedure

Data were collected via an online survey (Google Forms) during October–November 2025 using a convenience sampling approach. Participants were recruited from classes accessible to the research team with the support of lecturers, and no stratification by gender or academic major was applied. Ethical approval was obtained from a Vietnamese university (Approval No. 496/QĐ-ĐHH), and informed consent was secured from all participants prior to data collection.

The final sample comprised 1,091 university students, with a predominance of female participants (77.2%), largely reflecting the gender composition of teacher education and foreign language programs from which most participants were recruited. Students were primarily in their second (41.7%) and third (43.1%) years, and were drawn from three institutions (DHS: 23.4%, DHF: 25.8%, DHK: 50.8%). Academic performance was distributed across five GPA categories, with the majority classified as Good or above (see T1 Table 1).

3.2 Instruments

Four established instruments were used. The Time Management Questionnaire (TMQ) and the Metacognitive Self-Regulation Revised Scale (MSR-R) were translated and culturally adapted

Table 1. Sample characteristics (n = 1,091)

Variables	Classification	*N*	%
Gender	Female	842	77.2
	Male	249	22.8
Grades	Second-year student	455	41.7
	Third -year student	470	43.1
	Four-year student	166	15.2
Schools	DHS	255	23.4
	DHF	282	25.8
	DHK	554	50.8
GPA	Poor	77	7.1
	Average	191	17.5
	Good	360	33.0
	Very good	271	24.8
	Excellent	192	17.6

Source(s): Authors' own work

into Vietnamese using a forward–backward translation procedure with bilingual experts, followed by a pilot study to ensure clarity and semantic equivalence. The Irrational Procrastination Scale (IPS) and the Academic Motivation Scale (AMS) were adopted from previously validated Vietnamese versions.

TM: To assess students' TM, the TMQ (Britton and Tesser, 1991) was employed. The original scale includes 18 items across three subscales (Short-Range Planning, Time Attitudes, and Long-Range Planning) rated on a five-point Likert scale (1 = never to 5 = always). In the Vietnamese version, the scale was reduced to 11 items comprising two factors: Short-Range Planning (6 items; e.g. "Do you make a list of the things you have to do each day?") and Time Attitudes and Long-Range Planning (5 items; e.g. "Do you regularly review your class notes, even when a test is not imminent?"). The adaptation study (n = 183) demonstrated good reliability and construct validity (α = 0.887, KMO = 0.903, Bartlett's test $p < 0.001$). Exploratory factor analysis supported a two-factor solution (eigenvalue = 1.122), explaining 58.67% of the total variance, whereas the three-factor solution was not retained (eigenvalue <1). Factor loadings ranged from 0.442 to 0.855 for Short-Range Planning and from 0.359 to 0.827 for Time Attitudes and Long-Range Planning. Confirmatory factor analysis (CFA) further supported the model fit (χ^2/df = 1.551, CFI = 0.972, NFI = 0.928, TLI = 0.958, RMSEA = 0.024). In addition to statistical criteria, the merging of Time Attitudes and Long-Range Planning was supported by conceptual considerations, as both reflect a broader, future-oriented approach to time use, involving how individuals perceive, value, and plan their time in relation to long-term goals rather than immediate task execution. Thus, the two-factor structure was considered to preserve the conceptual integrity of the construct in the Vietnamese context. The total scale scores range from 11 to 55, with higher scores indicating better TM. In the main sample (n = 1,091), the scale demonstrated good internal consistency (α = 0.884).

SR: SR was measured using nine items from the MSR-R (Tock and Moxley, 2017; e.g. "I ask myself questions to make sure I understand the material I have been studying in my classes"), rated on a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree). The adaptation study (n = 156) demonstrated strong reliability and construct validity (α = 0.912, KMO = 0.917, Bartlett's test $p < 0.001$). EFA supported a one-factor solution (eigenvalue = 5.331), explaining 59.23% of the total variance, whereas the two-factor solution was not retained (eigenvalue <1). Factor loadings ranged from 0.683 to 0.839. CFA further supported the model fit (χ^2/df = 2.311, CFI = 0.953, NFI = 0.922, TLI = 0.921, RMSEA = 0.037). Total scores range from 9 to 63, with higher scores indicating better SR. In the main sample (n = 1,091), the scale demonstrated high internal consistency (α = 0.921).

AM: AM was assessed using the 28-item AMS (Vallerand *et al.*, 1992), which comprises seven subscales reflecting intrinsic motivation, extrinsic motivation, and amotivation (four items each; e.g. "Because I experience pleasure and satisfaction while learning new things"; "In order to have a better salary later on"; "Honestly, I don't know; I feel that I am wasting my time in school"), rated on a 7-point Likert scale (1 = not true at all to 7 = very true). Although the AMS is theoretically multidimensional, the present study operationalized AM as a global construct to capture overall motivational orientation. This approach is consistent with prior studies that have utilized the AMS as a composite index reflecting general levels of AM (Pham *et al.*, 2024). Total scores range from 28 to 196, with higher scores indicating higher levels of AM. In the present sample (n = 1,091), the scale demonstrated good reliability (α = 0.931).

AP: AP was measured using the IPS (Steel, 2007). The scale consists of nine items, including three reverse-scored items, rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A sample item is: "I delay tasks beyond what is reasonable". Total scores range from 9 to 45, with higher scores indicating greater levels of procrastination. Although the IPS was originally developed to assess general procrastination, it is appropriate for measuring AP in the present study because the response instructions were contextualized to the academic setting. Moreover, prior research conducted with Vietnamese university students has employed the IPS to assess procrastination in academic contexts and

reported satisfactory reliability (Ho *et al.*, 2024). In the current sample (n = 1,091), the scale likewise demonstrated good internal consistency (α = 0.794).

3.3 Data analysis

Data were analyzed in two phases. In Phase 1, pilot samples (n = 183 for TMQ; n = 156 for MSR-R) were used to adapt and validate the instruments. Internal consistency was assessed using Cronbach's alpha, and EFA and CFA were conducted using SPSS 20 and AMOS 20, respectively, to establish construct validity.

In Phase 2, the main sample (n = 1,091) was analyzed. SPSS 20 was used to compute reliability coefficients, descriptive statistics, Pearson correlations, and independent samples t-tests for gender differences. Structural relationships were examined using Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS 3.9. PLS-SEM was selected due to the model's multiple mediation structure, potential non-normality, and its suitability for variance-based analysis and bootstrapped indirect effects. Prior to model estimation, multicollinearity was assessed using variance inflation factor (VIF) values. Model evaluation included path coefficients, coefficients of determination (R^2), effect sizes (f^2), and predictive relevance (Q^2). Bootstrapping with bias-corrected confidence intervals (CI) was used to assess the significance of direct and indirect effects, with effects considered significant when the CI did not include zero.

4. Results

4.1 Preliminary analyses

T2 *4.1.1 Descriptive statistics and correlation analysis.* Table 2 shows that TM was positively and strongly associated with SR (r = 0.592, p < 0.001) and positively associated with AM (r = 0.443, p < 0.001). TM was also negatively and moderately associated with AP (r = −0.242, p < 0.001). SR was positively and strongly associated with AM (r = 0.602, p < 0.001) and negatively and weakly associated with AP (r = −0.156, p < 0.001). AM showed a very small and non-significant correlation with AP (r = 0.020, p > 0.05).

T3 *4.1.2 Gender differences.* Independent-samples t-tests revealed significant gender differences in TM, AM, and AP (p < 0.05), but not in SR (p > 0.05) (see Table 3). However, the effect sizes were small (Cohen's ds ranging from 0.115 to 0.287), suggesting that the practical significance of these differences was minimal despite statistical significance. Given the small effect sizes, gender was treated as a control variable in subsequent analyses.

4.2 Mediation analysis

T4 All inner VIF values were below 3 (see Table 4), indicating no multicollinearity concerns; additionally, values below 3.3 suggest that common method bias is unlikely to be a serious

F2 issue. Path analysis (Figure 2) showed that TM positively and significantly predicted SR (β = 0.605, p < 0.001, f^2 = 0.570), indicating a large effect size, negatively and significantly

Table 2. Descriptive statistics and correlation analysis

Variables	Possible total score range	M ± SD	TM	SR	AM
TM	11–55	35.526 ± 7.291	1		
SR	9–63	46.039 ± 9.136	0.592***	1	
AM	28–196	148.327 ± 24.007	0.443***	0.602***	1
AP	9–45	28.544 ± 4.226	−0.242***	−0.156***	0.020

Note(s): **: p < 0.01; ***: p < 0.001

Source(s): Authors' own work

Table 3. Gender differences in study variables

Variables	Male (n = 249) M ± SD	Female (n = 842) M ± SD	$t_{(1089)}$	Cohen's d
TM	34.185 ± 7.831	35.923 ± 7.080	−3.143**	0.247
SR	45.261 ± 9.770	46.268 ± 8.934	−1.529	0.115
AM	143.345 ± 27.802	149.801 ± 22.573	−3.352**	0.287
AP	29.024 ± 3.940	28.401 ± 4.300	2.145*	0.153

Note(s): **: $p < 0.01$; *: $p < 0.05$
Source(s): Authors' own work

Table 4. Direct and indirect effects of TM on AP

Direct effects	VIF	β	f^2
TM → AP	1.604	−0.165**	0.022
TM → SR	1.010	0.605***	0.570
TM → AM	1.010	0.437***	0.238
SR → AP	2.065	−0.161**	0.016
AM → AP	1.655	−0.255**	0.052
Gender → AM	1.010	0.090**	0.010
Gender → SR	1.010	−0.015	0.000
Gender → AP	1.026	−0.005	0.000

Indirect effects	β	95% CI
TM → SR → AP	−0.097**	[−0.146; −0.031]
TM → AM → AP	−0.111**	[−0.159; −0.062]
Total indirect effect	−0.209***	[−0.260; −0.148]

Total effect	β	95% CI
TM → AP	−0.374***	[−0.465; −0.271)

Note(s): **: $p < 0.01$; ***: $p < 0.001$
Source(s): Authors' own work

predicted AP (β = −0.165, $p < 0.01$, $f^2 = 0.022$), reflecting a small effect, and positively and significantly predicted AM (β = 0.437, $p < 0.001$, $f^2 = 0.238$), suggesting a medium effect size. SR negatively and significantly predicted AP (β = −0.161, $p < 0.01$, $f^2 = 0.016$), indicating a small effect, while AM negatively and significantly predicted AP (β = −0.255, $p < 0.01$, $f^2 = 0.052$), also representing a small effect size. Some structural paths have small effect sizes; however, small effects are common in complex behavioral models and can still be meaningful in educational contexts. Even modest contributions of TM, SR, and AM to AP may have practical relevance when considered together, particularly for designing interventions that target multiple determinants of AP. The bivariate correlation between AM and AP was not significant, yet AM significantly predicted AP in the path model. This discrepancy reflects the fact that path coefficients estimate the unique effect of AM after controlling for TM, SR, and gender, whereas bivariate correlations represent unadjusted associations.

As presented in Table 5, the R^2 values indicate that the model explains 20.7% of the T5
variance in AM, 23.9% in AP, and 36.4% in SR. These results suggest that the model

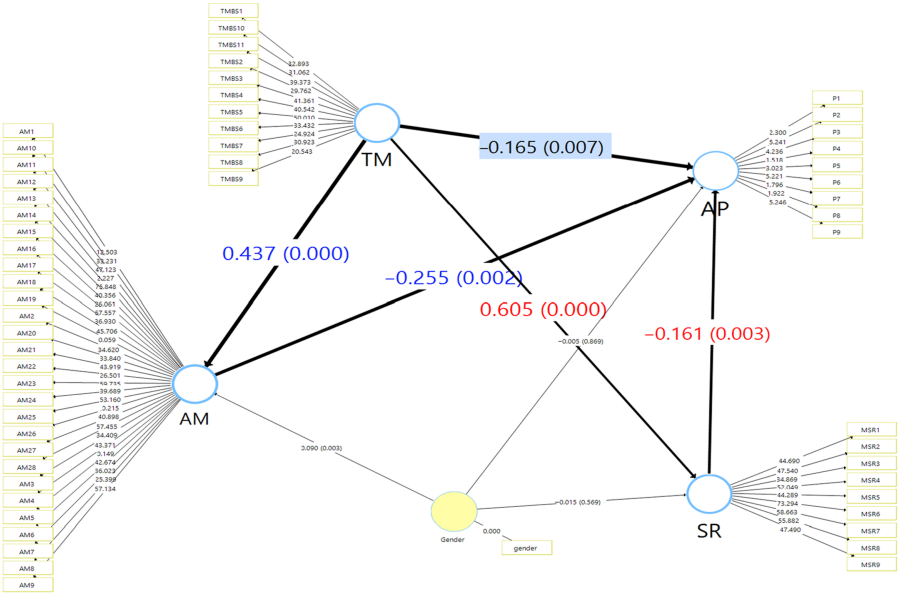

Figure 2. SR and AM as parallel mediators of the relationship between TM and AP. Source: Authors' own work

Table 5. Coefficient of determination (R^2) and predictive relevance (Q^2)

Construct	R^2	R^2 adjusted	Q^2
AM	0.207	0.205	0.093
AP	0.239	0.236	0.048
SR	0.364	0.363	0.221

Source(s): Authors' own work

demonstrates a moderate level of explanatory power, with SR exhibiting the highest level among the endogenous constructs. Regarding predictive relevance, all Q^2 values are greater than zero (AM = 0.093, AP = 0.048, SR = 0.221), indicating that the model has acceptable predictive relevance. Among the constructs, SR shows the strongest predictive capability, followed by AM and AP. Overall, these findings provide evidence that the structural model possesses adequate explanatory and predictive capacity, supporting its suitability for further analysis.

Mediation analysis (Table 4) showed that the effect of TM on AP through SR was significant ($\beta = -0.097$, $p < 0.01$, 95% CI = [−0.146, −0.031]). Similarly, the effect of TM on AP through AM was significant ($\beta = -0.111$, $p < 0.01$, 95% CI = [−0.159, −0.062]). Notably, the indirect effect through AM was slightly larger than the indirect effect through SR. These results suggest that SR and AM partially mediate the association between TM and AP among students. The total indirect effect of TM on AP through both mediators was significant ($\beta = -0.209$, $p < 0.001$, 95% CI = [−0.260, −0.148]).

5. Discussion

AP has become increasingly prevalent among university students, particularly in the Vietnamese context. Accordingly, identifying factors associated with AP is essential for interpreting the present findings and for informing interventions aimed at reducing academic stress and enhancing students' academic performance. The following section discusses the main findings of the present study.

The negative association between TM and AP suggests that TM may function as a protective resource against AP among Vietnamese university students. This finding aligns with prior empirical research across diverse cultural contexts (Wolters *et al*., 2017; Liu *et al.*, 2022; Faure-Carvallo *et al.*, 2025), thereby supporting the cross-contextual robustness of this relationship. From the perspective of Self-Regulated Learning theory, TM is regarded as a core component that enables learners to monitor, coordinate, and control their learning processes (Wolters and Brady, 2021). Students with high levels of TM competence tend to be more proactive in goal setting, resource allocation, and the regulation of learning behaviors, which may be associated with a lower likelihood of procrastination. In contrast, ineffective use of time is often accompanied by difficulties in attentional control and in accurately evaluating task demands, which may be associated with a higher risk of AP (Liu *et al.*, 2022). Within the context of Vietnamese higher education, which is characterized by heavy academic workloads and high expectation pressures, TM may therefore serve as a crucial adaptive capacity that helps students align academic demands with available cognitive and behavioral resources.

The mediating role of SR indicates that SR partially explains the association between TM and AP, suggesting that the influence of TM extends beyond behavioral scheduling to deeper regulatory processes. This finding is consistent with previous studies demonstrating a positive association between TM and SR (Lourenço and Paiva, 2024; Saman Azari *et al*., 2024), as well as a negative association between SR and AP (Hasyim and Nastiti, 2022). According to Self-Regulated Learning theory, TM reflects the extent to which learners proactively plan, monitor, and control their use of time for academic tasks, thereby contributing to the strengthening of self-regulatory capacity (Pintrich and Zusho, 2007; Wolters and Brady, 2021). When self-regulatory capacity is enhanced, students are better able to maintain focus, regulate effort, and effectively monitor their learning progress, which in turn may be associated with lower levels of procrastination behavior, commonly regarded as an indicator of diminished SR (Zimmerman, 2000; Li *et al.*, 2022). This pattern suggests that TM becomes protective primarily when it is internalized into stable self-regulatory competencies rather than remaining at the level of external planning strategies.

The findings point to AM as an important mediating mechanism underlying the association between TM and AP. One possible explanation for the prominence of AM may relate to its operationalization as a unidimensional construct in the present study. By aggregating different forms of motivation into a single composite measure, the analysis may have obscured the distinct effects of intrinsic motivation, extrinsic motivation, and amotivation, potentially amplifying the overall mediating effect of AM. Accordingly, the observed strength of this pathway should be interpreted with some caution, as it may partially reflect measurement-related simplification rather than purely substantive differences in psychological processes. This result is consistent with previous studies on the association between TM and AM (Peker, 2024; Fuadi and Almanshur, 2025; Makiah and Nusron, 2025), as well as between AM and AP (Asgari *et al*., 2025; Fuadi and Almanshur, 2025; Vlachopanou *et al*., 2025). Drawing on Social Cognitive Theory (Bandura, 1991) and Self-Determination Theory (Deci and Ryan, 1985, 2000), it can be argued that effective TM enables students to organize their learning activities in a goal-oriented manner while enhancing their sense of competence and behavioral control, which may be associated with higher levels of AM. When AM, particularly intrinsic motivation, is strengthened, students tend to engage more actively in learning tasks and reduce avoidance behaviors, which may be associated with lower levels of procrastination (Senécal *et al*., 1995; Vlachopanou *et al.*, 2025). Conversely, low motivation or states of amotivation may undermine task engagement and increase tendencies toward procrastination (Aliyev

et al., 2024). Within the context of Vietnamese higher education, where students' AM is often strongly influenced by extrinsic goals, TM may be considered an important resource for strengthening AM and reducing procrastination as a maladaptive coping strategy.

Notably, the indirect pathways collectively accounted for a larger proportion of the association between TM and AP than the direct pathway, underscoring the central role of internal psychological mechanisms. The relatively stronger mediating effect of AM suggests that motivational processes may play a comparatively more prominent role in translating time-related competencies into reduced procrastination, especially in contexts characterized by high external expectations and performance pressures. However, it should be noted that the effect sizes observed in the model are generally small to moderate, and therefore these findings should be interpreted with caution in terms of their practical magnitude. Nevertheless, even small effects can have meaningful implications in educational contexts, particularly when multiple predictors collectively influence AP. Interventions targeting TM, SR, and AM may therefore benefit from addressing several factors simultaneously, as modest contributions from each can cumulatively reduce procrastination behaviors. It is also noteworthy that AM was not significantly associated with AP at the bivariate level but became significant in the structural model. This pattern suggests that the role of AM may not be fully captured when examined in isolation, but becomes more evident when considered alongside related self-regulatory processes within an integrated framework. Statistically, this pattern reflects a suppression effect, where a predictor may show a non-significant zero-order correlation but a significant effect in a multivariate model after controlling for overlapping variance (MacKinnon *et al*., 2000). Thus, although AM was not correlated with AP at the bivariate level, its significant structural path likely reflects its unique contribution once self-regulatory processes are accounted for. From the perspective of Self-Determination Theory (Deci and Ryan, 1985, 2000), the stronger mediating role of AM may reflect differences in motivational quality. This theory distinguishes between autonomous and controlled forms of motivation, which differentially predict behavioral persistence (Hagger *et al*., 2014). Autonomous motivation, grounded in personal endorsement and the valuing of intrinsic goals, is typically associated with more sustained engagement. In contrast, controlled motivation, influenced by external contingencies or internal pressures, tends to be less stable and more likely to result in withdrawal from the behavior (Deci and Ryan, 1985, 2000; Hagger *et al*., 2014). In demanding academic contexts such as Vietnamese higher education, students may possess relatively well-developed self-regulatory strategies yet still procrastinate if their engagement is primarily externally regulated. TM may therefore be associated with lower levels of procrastination, potentially through improvements in planning efficiency but also by strengthening students' perceived competence and autonomy, thereby fostering more autonomous forms of motivation (Deci and Ryan, 1985, 2000). Thus, motivational quality, rather than self-regulatory capacity alone, may play a comparatively more prominent role in explaining variations in students' AP. Cultural context may further clarify why AM emerged as a particularly influential mediator. In collectivistic and performance-oriented educational systems such as Vietnam, academic engagement is often shaped by strong family expectations and societal standards of achievement. Under these conditions, TM skills may not automatically translate into reduced AP unless accompanied by more autonomous forms of motivation. This contextual factor may partly explain the relatively stronger mediating role of AM observed in the present sample.

Despite the substantial indirect effects observed, the mediation remained partial rather than full. This indicates that TM maintains a direct association with AP even after accounting for SR and AM. Such a configuration suggests that additional mechanisms, such as emotional regulation, task aversiveness, or contextual academic stressors, may also contribute to procrastination. The persistence of this direct pathway reflects the multifaceted nature of AP, which cannot be fully explained by SR and AM alone.

5.1 Implications and limitations

This study offers several theoretical contributions to the literature on AP. First, by examining Vietnamese university students, it extends the cultural scope of research on TM and AP beyond predominantly Western contexts. Second, by employing a parallel mediation model, the study moves beyond simple correlational approaches and elucidates the psychological mechanisms linking TM and AP. Specifically, the findings demonstrate that this association is substantially transmitted through SR and AM, with motivational processes playing a comparatively stronger role. By integrating self-regulated learning frameworks and self-determination theory within a unified structural model, the study refines existing TM–AP models and provides a more comprehensive explanation of AP in higher education. Importantly, these findings do not invalidate prior models emphasizing a direct TM–AP association; rather, they suggest that this relationship is more comprehensively understood as operating through motivational and self-regulatory mechanisms. While SR remains an important pathway, the comparatively stronger mediating role of AM indicates that existing TM–AP models may benefit from recalibration to assign greater theoretical weight to motivational dynamics.

The following implications should be considered with appropriate caution given the methodological scope of the study. Given that AM emerged as the dominant mediator between TM and AP, the effectiveness of TM interventions appears to depend primarily on strengthening students' motivational processes. Accordingly, curriculum-based TM training in Vietnamese higher education may benefit from integrating intrinsic motivation enhancement, perceived task value, and academic self-efficacy development alongside core planning skills, thereby promoting sustained motivational internalization rather than short-term skill acquisition. Although SR also contributes to the mediation pathway, its comparatively smaller indirect effect suggests that structured SR workshops may function most effectively as complementary components that reinforce monitoring, goal adjustment, and behavioral control strategies.

At the institutional level, higher education institutions may consider embedding motivationally informed TM development within formal curricula and student support systems to ensure systemic rather than fragmented implementation. Human resource managers may incorporate motivational and self-regulatory competencies into faculty development programs to strengthen autonomy-supportive teaching practices. Policy makers could consider integrating structured TM and motivation-enhancement components into broader student development frameworks to align institutional standards with evidence-based mechanisms identified in the mediation model. In addition, academic counseling programs may implement tiered interventions that simultaneously target motivational regulation and behavioral planning for students exhibiting persistent procrastination patterns.

In addition to the contributions outlined above, this study has several limitations. First, the cross-sectional design allows only the examination of associations at a single time point and does not permit causal inference among TM, SR, AM, and AP. Future research employing longitudinal or experimental designs would provide stronger evidence regarding the directionality and causal mechanisms underlying these relationships. Intervention-based studies implementing structured TM or SR training programs would further strengthen the evidence base. In particular, longitudinal designs could test whether the mediating roles of AM and SR remain stable over time or vary across academic semesters, thereby providing a more rigorous examination of the proposed parallel mediation framework. Second, the use of convenience sampling may limit the representativeness and generalizability of the findings to the broader population of Vietnamese university students. Because participants were recruited from classes accessible to the research team, the sample may not fully capture the diversity of students across academic disciplines, institutional contexts, or learning environments, which may in turn influence both the levels of AP and the strength of associations among the studied variables. Future studies using probability-based sampling strategies and involving students from a wider range of universities across different regions would enhance external validity. In

addition, the sample was characterized by a substantial gender imbalance, largely reflecting the disciplines represented in the study. Although this distribution mirrors the gender composition of teacher education and foreign language programs in Vietnam, it may nonetheless restrict the generalizability of the findings to more gender-balanced or male-dominated academic contexts. Given that prior research suggests potential gender differences in TM, SR, and AM (Bembenutty, 2009; Duckworth *et al.*, 2015; Li *et al.*, 2025), this imbalance may also influence the observed patterns of relationships, potentially reflecting tendencies more characteristic of female students. Although gender was statistically controlled in the analyses, such control does not fully eliminate potential bias, and the findings should therefore be interpreted with appropriate caution. Future research with more gender-balanced samples could further examine whether the proposed mediation model operates similarly across gender groups. Multi-group structural analyses could be conducted to test measurement invariance and structural path equivalence across gender and academic disciplines, thereby clarifying whether the relative strength of AM and SR differs across subpopulations. Third, the study did not include additional individual and contextual factors (e.g. personality traits, self-efficacy, academic pressure, or family and institutional support) that may also be relevant. Moreover, comparative studies across academic disciplines (e.g. social sciences, engineering, and health sciences) and different institutional contexts (e.g. public vs. private universities) would help determine whether disciplinary demands or institutional characteristics influence or moderate the observed associations. Extending this line of inquiry to cross-cultural contexts would also be valuable. Comparative research between Vietnamese students and those in other Southeast Asian or Western higher education systems could help determine whether the prominence of AM as a mediator reflects culturally embedded motivational patterns or represents a more universal mechanism linking TM and AP. It should also be noted that AM was operationalized as a unidimensional construct in the present study. While this approach allows for capturing overall motivational orientation, it may obscure the distinct and potentially divergent effects of intrinsic motivation, extrinsic motivation, and amotivation. Future research should examine these dimensions separately to provide a more nuanced understanding of their specific roles in AP. Additionally, reliance on self-report measures represents a potential source of common method bias and social desirability effects, which may inflate the observed relationships among variables. Future research could address this limitation by incorporating multi-source data (e.g. instructor evaluations, academic performance records) or employing mixed-method designs to triangulate findings and mitigate common method variance. Finally, although PLS-SEM was utilized to accommodate the multiple mediation model and potential non-normality of the data, covariance-based SEM (CB-SEM) may also be appropriate given the well-established constructs and large sample size. Future studies are encouraged to replicate the analyses using CB-SEM to examine the robustness of parameter estimates and overall model fit.

6. Conclusion

This study examined the relationship between TM and AP among Vietnamese university students, with AM and SR as parallel mediators. The findings show that TM is negatively associated with AP, with both AM and SR partially mediating this relationship, and AM demonstrating a stronger effect. These results contribute by integrating TM, AM, and SR within a unified mediation framework and extending AP research to a non-Western context. Practically, they suggest that interventions should combine TM training with strategies that strengthen AM and SR. Despite these contributions, the cross-sectional design and convenience sampling limit causal inference and generalizability. However, the use of validated measures and appropriate analytical techniques may help to enhance the robustness of the findings. Future research should adopt longitudinal designs and more diverse samples to further examine the proposed model. Overall, this study provides a more integrative understanding of AP, highlighting the importance of psychological mechanisms in shaping students' academic behaviors.

Authors contribution
Ba Phu Nguyen: wrote the paper and collected the data. *Thi Truc Quynh Ho*: Conceived and designed the analysis; used analysis tools; performed the analysis; wrote the paper; edited the manuscript after review; responded to review. *Van Khuyen Le*: collected the data.

Ethical approval
All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee. Ethical permission was obtained from a university in Vietnam.

Informed consent
Informed consent was obtained from all individual participants included in this study.

Availability of data and material
The data supporting the findings of this study are available from the authors upon reasonable request.

Use of AI statement
The authors declare that ChatGPT, an artificial intelligence–based language model developed by OpenAI, was used solely for translation and language editing purposes, and did not influence the study design, data analysis, interpretation of results, or conclusions.

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