

Investigating the Factors Influencing Academic Procrastination Among Students: A Grounded Theory Study

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ABSTRACT

Purpose: The objective of this study was to identify and conceptualize the causal, contextual, and intervening factors influencing academic procrastination among students in District 6 of Tehran using a grounded theory approach.

Methods and Materials: This research employed a qualitative design using the grounded theory methodology. Semi-structured interviews were conducted with 30 male students aged 15–18 years in District 6 of Tehran, selected purposively based on inclusion criteria and academic procrastination scores. Data collection continued until theoretical saturation was reached. Interviews were audio-recorded, transcribed verbatim, and analyzed using open, axial, and selective coding. The coding process generated categories and subcategories that were integrated into a conceptual model. Credibility, dependability, confirmability, and transferability criteria were applied to ensure trustworthiness. Ethical considerations included informed consent, confidentiality, voluntary participation, and the right to withdraw at any stage.

Findings: Analysis revealed three overarching themes shaping academic procrastination: causal factors, contextual factors, and intervening factors. Causal factors included low achievement motivation, weak academic planning, test anxiety, fear of failure, excessive perfectionism, negative academic self-beliefs, and low self-efficacy. Contextual factors comprised unsupportive family environments, grade-oriented educational systems, unengaging teaching methods, high academic workload, lack of study skills training, poor study environments, and excessive digital media use. Intervening factors included personal and family stress, social support, parent-child relationship patterns, peer influence, feedback quality, prior academic failures, and socioeconomic conditions.

Conclusion: The findings indicate that academic procrastination among students is shaped by a complex interplay of psychological, familial, educational, social, and contextual influences.

Keywords: Academic procrastination, grounded theory, students

1. Introduction

Academic procrastination has emerged as a pervasive and multidimensional challenge in contemporary educational systems, influencing students across cultures, socioeconomic backgrounds, and academic levels. It is widely conceptualized as the voluntary delay of academic tasks despite awareness of potential negative consequences, a behavioral tendency associated with cognitive, emotional, motivational, and environmental factors. As education systems have become increasingly competitive and performance-driven, the prevalence of procrastination has intensified, prompting scholars to investigate its antecedents and consequences with greater precision (Svartdal et al., 2020). Academic procrastination is no longer viewed as a simple failure of time management; rather, it is understood as a complex self-regulatory breakdown shaped by psychological processes, motivational deficits, contextual constraints, and maladaptive coping strategies (Choi & Yang, 2024). The deepening of this understanding has allowed researchers to shift their focus from surface-level behaviors to underlying mechanisms that sustain procrastination episodes.

A growing body of empirical research highlights the significant psychological mechanisms underpinning academic procrastination. For instance, intrusive "should-thinking," self-imposed standards, and maladaptive cognitions have been identified as key triggers that distort students' internal dialogue, paving the way for regulatory failure and emotional disengagement (Choi & Yang, 2024). Feelings of anxiety, hopelessness, and emotional conflict frequently co-occur during procrastination episodes and influence the student's likelihood to initiate tasks (Gadosey et al., 2021). Similarly, decision-related procrastination contributes to emotional discomfort, shaping how students perceive deadlines, academic pressure, and personal competence (Hen & Goroshit, 2020). These findings underscore that academic procrastination is not merely an issue of irrational delay but is intertwined with emotions such as fear of failure, self-doubt, and avoidance of negative self-evaluation.

Motivation-related theories further contribute to understanding the psychological roots of procrastination. Self-determination theory suggests that a lack of internalized motivation is a central determinant of behavioral delay, as students without psychological need satisfaction—autonomy, competence, and relatedness—struggle to maintain task engagement and persistence (Reeve, 2023).

Empirical evidence shows that motivational persistence moderates the link between behavioral deactivation and academic procrastination, indicating that students with low sustained motivation are more vulnerable to engaging in delay behaviors (Groza & Tofan, 2024). When motivation declines, students tend to gravitate toward short-term emotional relief, avoiding effortful academic demands in favor of immediate gratification (Azimi et al., 2023). In this sense, procrastination becomes a mechanism for emotion regulation rather than a simple act of laziness.

Beyond psychological factors, social and environmental variables also exert considerable influence on procrastinatory behaviors. Family functioning plays an important role in fostering academic engagement, where supportive family interactions enhance resilience and reduce tendencies toward avoidance (Gharibii et al., 2022). In contrast, dysfunctional home environments and parental pressure heighten emotional distress and subsequently increase procrastination. School environments, too, may inadvertently foster procrastination through poorly designed learning structures, unengaging teaching methods, or excessive academic workloads (Svartdal et al., 2020). Students who lack effective study skills or experience inconsistent instructional support often turn to avoidance as a coping mechanism and progressively develop chronic procrastination patterns (Heidari & Nerimani, 2021). These findings demonstrate the necessity of adopting an ecological perspective, recognizing that procrastination is shaped by an interplay of individual, relational, and institutional dynamics.

Technological influences offer another explanatory dimension. In recent years, the digital landscape—particularly social media—has been identified as both a distraction and a source of emotional comfort for students experiencing academic strain. Excessive or problematic social media use correlates with heightened procrastination, especially among adolescents who struggle with impulsivity and difficulty delaying gratification (Khan et al., 2025). Social media addiction appears to amplify patterns of avoidance by consuming cognitive resources and reducing time available for academic engagement (Sadiq et al., 2025). Additionally, smartphone overuse and mobile dependency have been associated with different dimensions of academic procrastination, suggesting that technology has reshaped procrastinatory behavior into a more persistent and omnipresent problem (Khosravi et al., 2022). During the COVID-19 pandemic, online learning environments and increased screen exposure further complicated the issue.

Research revealed that academic procrastination in virtual contexts was linked to depressive symptoms, lowered motivation, learning fatigue, and even suicidal ideation among university students (Cjuno et al., 2023). These findings show that modern procrastination is deeply intertwined with the digital ecosystem and emotional well-being.

The broader academic literature also highlights critical developmental and situational factors contributing to procrastination. Among younger students, academic burnout, exhaustion, and emotional disengagement predict higher levels of avoidance behavior (Logenio et al., 2023). During periods of heightened academic stress, such as final examinations, students frequently display fluctuating levels of anxiety, hope, and ambivalence, which shape their decision to study or procrastinate (Gadosey et al., 2021). Personality and cognitive factors—including early maladaptive schemas, alexithymia, low self-efficacy, and emotional dysregulation—further contribute to chronic academic delay (Rad et al., 2025; Rostami Torznogh et al., 2025). The relationship between procrastination and academic self-efficacy is particularly well-established: low perceived competence predicts task avoidance, while higher efficacy promotes persistence and timely task initiation (Meng et al., 2025; Rad et al., 2025). Students who perceive their abilities negatively tend to avoid tasks that challenge their sense of competence, reinforcing cycles of procrastination and academic disengagement.

An emerging body of research has explored clinical and psychopathological dimensions of procrastination, including its associations with internet addiction, depressive symptoms, emotional numbness, and cognitive distortions (Cjuno et al., 2023; Geng et al., 2018; Shportun et al., 2022). These studies suggest that procrastination may serve as a behavioral manifestation of underlying psychological distress. Moreover, early research indicates substantial cross-national variability in the prevalence and expression of academic procrastination, influenced by culture-specific beliefs, educational expectations, and social norms (Kurniawan, 2024; Nadarajan et al., 2023). For example, research among medical students revealed that high academic pressure and perfectionistic standards significantly contribute to elevated procrastination levels (Khan, 2025). The generalizability of these findings across academic contexts signifies the need for context-sensitive frameworks capable of explaining how cultural and environmental factors interact with psychological predispositions.

Intervention-based studies have attempted to mitigate procrastination by enhancing cognitive, emotional, and motivational capacities. Evidence demonstrates that cognitive-behavioral therapy, motivational interviewing, multidimensional cognitive-motivational interventions, and attributional retraining can significantly reduce procrastination levels among students of diverse age groups (Hosseini et al., 2020; Ne'matzadeh Suteh et al., 2023; Pazos & Cózar, 2023; Sarrami & Ghasemi, 2022). Psychological flexibility, resilience, and emotional well-being have also shown promise as protective factors against academic procrastination (Hamalainen et al., 2023). Nevertheless, despite the proliferation of intervention frameworks, the root causes of procrastination remain insufficiently explained within school environments. Many models are adapted from adult populations or clinical samples, limiting their relevance to adolescents and students in specific regional contexts.

The growing complexity of procrastination in modern educational systems calls for analytical models capable of capturing the interconnected roles of individual, contextual, and relational factors. Qualitative research, particularly grounded theory, offers a promising methodology for developing such models through the exploration of subjective experiences, daily routines, and perceived barriers to academic engagement (Azimi et al., 2023; Mehrjoo, 2022). In-depth qualitative studies allow researchers to identify unique cultural and systemic contributors that may not be visible through standardized quantitative measures. For example, studies in Iran have shown that family expectations, pedagogical style, school culture, and broader socioeconomic pressures significantly shape students' procrastinatory behaviors (Gharibii et al., 2022; Mehrjoo, 2022). Such findings highlight the necessity of localized frameworks to inform educational policy, teacher training, and school-based interventions.

Given the increasing prevalence and academic consequences of procrastination among students in Tehran's educational districts, particularly District 6, there is a pressing need for context-grounded and empirically informed models that can reveal the underlying mechanisms of procrastination in this population. Existing research in Iran has mostly relied on quantitative approaches, leaving a notable gap in the qualitative exploration of how students, teachers, and school authorities conceptualize and experience procrastination within their real-life educational environments (Heidari & Nerimani, 2021). Moreover, cultural expectations, academic competition, familial

pressures, and technological influences appear to intersect in unique ways not fully captured by global literature. To bridge this gap, grounded theory provides an effective methodological pathway to uncover nuanced, emergent factors contributing to procrastination and to build a comprehensive model tailored to the lived experiences of students.

Therefore, the aim of this study is to identify and conceptualize the causal, contextual, and intervening factors influencing academic procrastination among students in District 6 of Tehran using a grounded theory approach.

2. Methods and Materials

The research method was qualitative. In this phase, grounded theory—also referred to as the data-driven or emergent theory approach—was used. In the qualitative stage, the data collected by the grounded theory researcher (so that processes may be examined) provide various forms of qualitative evidence. However, many grounded theory researchers predominantly use interviews (Bazargan, 2013). In the present study, as well, semi-structured interviews were used in the first stage for data collection. The use of semi-structured interviews allows the researcher to benefit from the advantages of structure in interviews—which prevents digression, provides framing, and ensures purposeful questioning—while also taking advantage of openness and discovery, enabling access to new and unpredictable information, the development of theory by the researcher, the integration of prior theoretical foundations, and deeper data insights.

Before interviewing participants, the interview content was developed based on the results of the preliminary study as well as the indicators identified in the theoretical foundations and literature and the objectives of the research. This content was then provided to researchers, professors, and experts in educational psychology. Following revision and approval, and after necessary coordination, the interviews were conducted. The duration of each interview, depending on conditions, participants' tolerance, and their willingness, was set between 45 and 60 minutes. At the beginning of each interview, the research purpose, procedures, risks and benefits, the voluntary nature of participation, and confidentiality were explained to participants. Participants' right to withdraw from the study at any time and the procedures established to protect them were emphasized. A written informed consent form was

obtained from the participants at the beginning of the interview.

The statistical population consisted of 30 students from schools in District 6 of Tehran, selected purposefully based on the inclusion criteria for the qualitative stage of the study and according to the results of the academic procrastination test. Ultimately, these 30 individuals were interviewed using semi-structured interviews, employing theoretical saturation sampling and grounded theory to identify the factors influencing their procrastination. The inclusion criteria were as follows: male students aged 15 to 18 years, willingness to participate in the training program, obtaining at least half of the maximum possible score on academic procrastination, and completing the informed consent form for participation in the training program. The exclusion criteria included: any psychiatric disorder based on self-report or hospitalization history, and unwillingness to continue participation.

The data collection instrument in this stage was a semi-structured interview specific to grounded theory, aimed at identifying the core, causal, intervening, contextual, strategic, and consequential factors related to students' procrastination. In such studies, the primary source of information is the researcher's in-depth conversation with participants. The interviewer conducted the interviews without bias or leading questions. During the interviews, participants' voices were recorded, and the audio files were listened to by the researcher to determine whether the content was understandable or required follow-up. Then, the interviews were transcribed, and coding was conducted. After classifying the codes and merging those related to formulated concepts, they were placed into specific thematic categories. Subsequently, they were organized into subcategories or sub-concepts, and finally, all concepts were categorized and divided according to the research objectives.

Efforts were also made to consider the four criteria for evaluating qualitative data—credibility, dependability, confirmability, and transferability. The researcher attempted to avoid any form of bias during data collection. To enhance credibility, after categorizing the information, the researcher repeatedly referred back to participants' statements. To ensure validity, after interviews, data extraction, and coding, participants were revisited, and their agreement with the researcher's interpretations was checked, and potentially important points were reviewed. Thus, participant verification was obtained. To ensure rigor in this study, the four criteria for qualitative data analysis—credibility, dependability, confirmability, and transferability—were taken into consideration.

The ethical considerations in the present study were as follows:

1. Participants' information remained confidential.
2. Completion of the informed consent form for participation in the training program.
3. No harm was inflicted on participants.
4. Participants took part voluntarily, and they were free to withdraw at any time if unwilling to continue.

In the qualitative method, grounded theory with coding specific to the data-driven approach (open coding, axial coding, and selective coding) was used. This type of analysis, in addition to interpreting data and topic

dimensions, also organizes the data and is widely used in ethnography and the analysis of interview text data. In this analysis, the obtained findings reflect the objectives set by the researcher and are the product of the data analysis process. The stages of thematic analysis include: data management, coding and categorization, and data interpretation and analysis.

3. Findings and Results

The demographic variables of the respondents were as follows:

Table 1

Age Status of Interviewees

Variable	Minimum	Maximum	Mean	Standard Deviation	Variance
Age	15	18	17.10	1.60	2.56

The initial codes derived from students' interviews are presented in Table 2:

Table 2

Initial Codes of Factors Influencing Academic Procrastination

No.	Initial Codes
1	Low academic motivation, lack of clear goals
2	Weak planning skills, lack of self-discipline
3	Fear of mistakes, excessive parental insistence
4	Low self-confidence, fear of failure
5	Lack of perseverance, depression
6	Lack of willpower, boredom
7	Test anxiety, stress, family issues
8	Mental fatigue, family distress
9	Inability to manage time, lack of motivation
10	Feeling that education is useless, lack of interest in major
11	Lack of self-confidence, high volume of course materials
12	Difficulty of subjects, poor teaching quality
13	Lack of proper teacher feedback, grade-oriented system
14	Unengaging teaching, lack of guidance
15	Grades valued over skills, inadequate academic counseling
16	Fatigue from repetitive and purposeless assignments, unfair teacher evaluations
17	Constant comparison with others, inappropriate educational environment
18	Lack of family support, negative peer influence
19	Excessive parental control, lack of sleep
20	Excessive use of social media
21	Parental neglect, inadequate nutrition
22	Economic pressures, lack of academic role models
23	Poor family economic status, lack of focus on learning
24	Low societal value of education, prioritization of connections over education for employment
25	Lack of time-management skills
26	Fear of negative evaluation from others
27	High parental expectations
28	Lack of interest in lessons, test anxiety
29	Fatigue and boredom
30	Lack of belief in one's abilities, preference for immediate gratification over long-term effort

The teachers' interviews were coded based on identifying the factors influencing academic procrastination among students in District 6 of Tehran:

Figure 1

Final Research Model

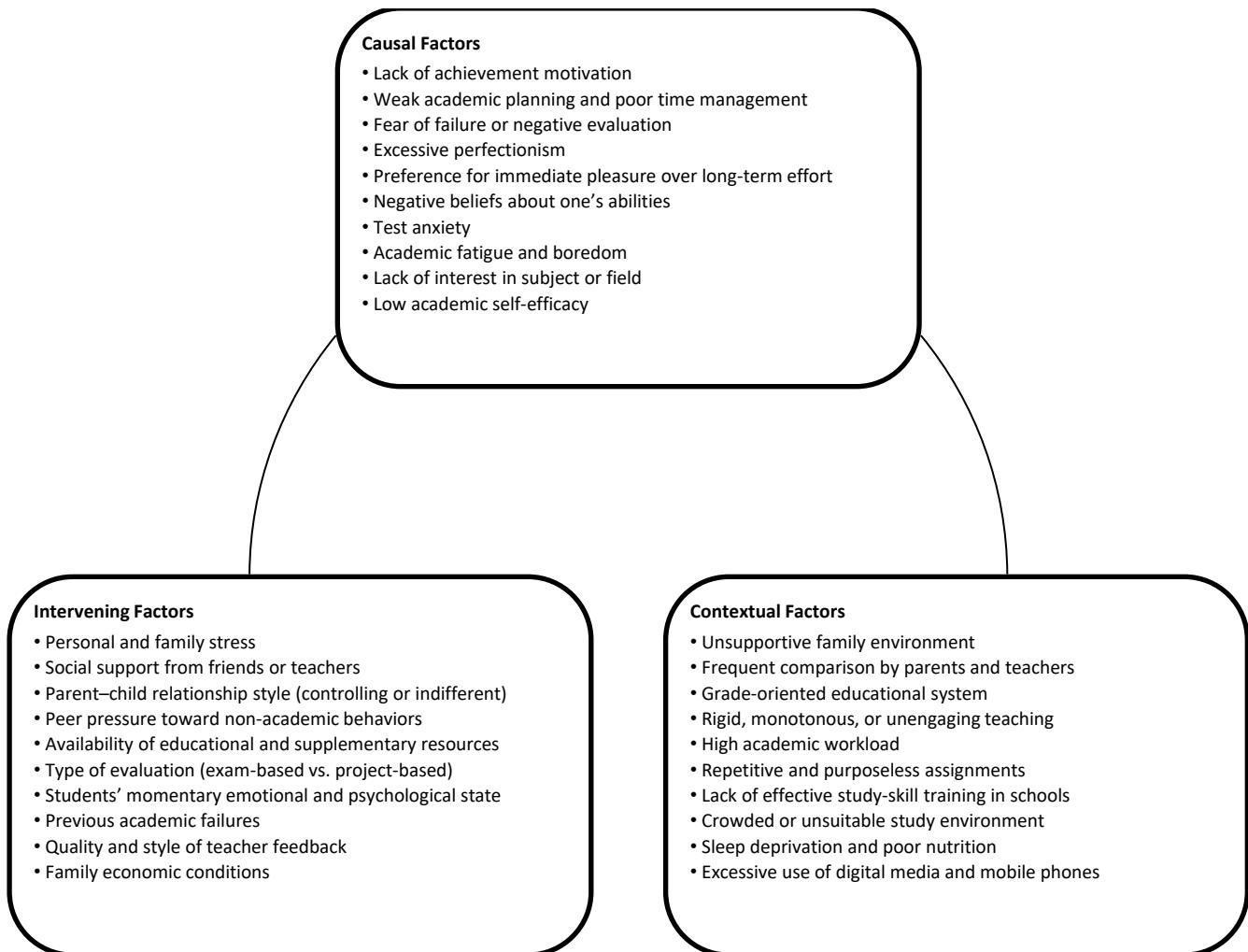


Table 3

School-Related Factors Influencing the Reduction of Students' Academic Procrastination

Basic Theme	Meaningful Codes
Lack of achievement motivation	Causal Factors
Weakness in academic planning and time management	
Fear of failure or negative evaluation	
Excessive perfectionism	
Preference for immediate pleasure over long-term effort	
Negative beliefs about one's abilities	
Test anxiety	
Academic fatigue and boredom	
Lack of interest in the subject or field of study	
Low academic self-efficacy	
Unsupportive family environment	Contextual Factors

Frequent comparisons by parents and teachers among students	Intervening Factors
Grade-oriented educational system	
Rigid and unengaging teaching	
High volume of academic content	
Repetitive and purposeless assignments	
Lack of effective study-skill training in schools	
Crowded and unsuitable study environment	
Sleep deprivation and poor nutrition	
Excessive use of digital media and mobile phones	
Personal and family stressors	
Social support from friends or teachers	
Nature of parent-child relationship (controlling or indifferent)	
Peer pressure toward non-academic behaviors	
Availability of supplementary educational resources	
Type of assessment (exam-based or project-based)	
Students' momentary emotional and psychological states	
Previous academic failure experiences	
Type of feedback received from teachers	
Family economic conditions	

4. Discussion and Conclusion

The purpose of this study was to identify the causal, contextual, and intervening factors influencing academic procrastination among students in District 6 of Tehran through a grounded theory approach. The results revealed a multidimensional and interconnected set of antecedents that shape procrastinatory behavior, highlighting academic, psychological, familial, social, instructional, and technological influences. The discussion below interprets these findings in light of the existing literature and demonstrates how the current results align with previous empirical evidence and theoretical assumptions.

The first category identified in the findings—causal factors—included low achievement motivation, fear of failure, excessive perfectionism, weak academic planning, test anxiety, negative self-beliefs, low self-efficacy, and preference for short-term pleasure over long-term goal pursuit. These findings strongly align with the extensive body of research confirming that motivational deficits and maladaptive cognitive patterns are essential determinants of academic procrastination. For instance, the role of internal motivational failure is widely documented, showing that ineffective self-regulation and low intrinsic drive increase students' likelihood of delaying academic tasks (Groza & Tofan, 2024; Reeve, 2023). The present findings corroborate earlier work indicating that “should-thinking”—rigid internal expectations and self-imposed standards—plays a crucial role in increasing cognitive pressure and weakening self-initiated behavior (Choi & Yang, 2024). This mechanism also helps explain why perfectionism and fear of

negative evaluation were central themes in students' narratives.

The association between anxiety, emotional dysregulation, and procrastination also emerged clearly in the present study. Previous literature extensively demonstrates that anxiety and hopelessness frequently co-occur during procrastination episodes and influence students' willingness to initiate academic tasks (Gadosey et al., 2021). Consistent with this evidence, students in this study reported test anxiety, academic fatigue, and emotional discomfort as significant triggers for task avoidance. This finding further aligns with results showing that both decisional procrastination and academic procrastination contribute to negative feelings and emotional conflict, influencing students' long-term engagement in academic tasks (Hen & Goroshit, 2020). In this regard, the current study adds depth by showing how emotional states interact with personal beliefs and self-efficacy to form a cycle of avoidance.

Low academic self-efficacy was also a recurring theme among participants. A robust connection between self-efficacy and procrastination has been confirmed in prior studies. Students who perceive themselves as incapable or incompetent are more likely to postpone tasks, reinforcing negative emotional states and deepening avoidance patterns (Rad et al., 2025). Likewise, research among doctoral students showed that self-efficacy and supervisory support predict reduced procrastination, indicating how belief in one's academic capabilities strengthens persistence (Meng et al., 2025). The current findings reinforce the conclusion that low self-efficacy is not only a consequence of

procrastination but also a powerful antecedent that can perpetuate academic disengagement.

The second major category—contextual factors—highlighted structural and environmental influences on procrastination, including unsupportive family environments, constant comparisons by parents and teachers, grade-oriented educational systems, unengaging teaching methods, repetitive assignments, high content volumes, poor study environments, sleep deprivation, nutritional deficiencies, and excessive use of digital media. These findings parallel earlier research demonstrating that family functioning significantly predicts academic engagement and academic resilience (Gharibii et al., 2022). When families fail to provide emotional support, clear expectations, or balanced supervision, students are more likely to develop avoidance-based coping strategies, reinforcing procrastination behaviors.

The educational system itself was identified as a contributor to academic procrastination, particularly through grade-centered evaluation, monotonous instruction, and excessive academic workloads. These findings are consistent with research demonstrating that poorly designed instructional environments can foster academic procrastination by creating emotional disengagement, cognitive overload, and diminished student autonomy (Svartdal et al., 2020). Similarly, the current study's result regarding unengaging teaching echoes evidence from other studies showing that inadequate teacher feedback and instructional monotony contribute to feelings of academic burnout and subsequent procrastination (Logenio et al., 2023). The emphasis on grades over skill development also aligns with research indicating that students in high-pressure evaluative environments tend to delay tasks to avoid emotional discomfort associated with performance evaluation (Groza & Tofan, 2024).

The influence of technology and digital media emerged strongly in the contextual category. Excessive mobile phone use, social media overconsumption, and digital distraction were among the key findings of the present study. These findings validate previous evidence showing that social media addiction is strongly associated with academic procrastination among adolescents and university students (Khan et al., 2025; Sadiq et al., 2025). Problematic use of social media has been shown to reduce cognitive control, diminish attention capacity, and increase avoidance tendencies, especially among individuals with underlying impulsivity or emotional stress. This is consistent with the current study's identification of digital usage as both a

contextual and an intervening factor in students' procrastination behavior.

The third major category—intervening factors—included personal and family stress, social support from teachers and peers, the nature of the parent-child relationship, peer pressure toward non-academic activities, availability of educational resources, assessment types, emotional states, previous academic failures, teacher feedback, and socioeconomic conditions. The importance of emotional and psychosocial stressors in facilitating procrastination aligns strongly with studies linking depressive symptoms, emotional difficulties, and stress to heightened academic procrastination (Cjuno et al., 2023). Students experiencing chronic stress or emotional instability are more likely to avoid tasks as a means of temporary emotional relief.

Peer dynamics and social pressures also contributed to students' procrastination, reinforcing findings indicating that social-contextual variables—including peer norms and social expectations—shape procrastinatory behavior. Research conducted among Thai students revealed that academic procrastination significantly contributes to internet addiction and other maladaptive behaviors influenced by peer norms (Nadarajan et al., 2023). Likewise, research examining maladaptive schemas suggests that social relationships influence emotional processing and avoidance tendencies, linking social pressures to academic delay (Rostami Torznogh et al., 2025). The present findings provide further evidence that peer and social factors play a critical role in shaping students' academic self-regulation.

Previous academic failure also emerged as an important intervening factor, which is consistent with studies showing that past negative experiences significantly influence future avoidance behaviors due to fear of repetition (Hen & Goroshit, 2020). Moreover, the current study found that teacher feedback—whether supportive, neutral, or critical—shaped students' motivation and engagement. This result is consistent with evidence suggesting that positive instructional support, constructive feedback, and relationship quality significantly determine students' psychological readiness and reduce procrastination (Hamalainen et al., 2023).

Socioeconomic background was another intervening factor that shaped procrastinatory tendencies. Students from economically disadvantaged families reported less access to educational resources, more environmental stress, and limited emotional support. Prior studies echo this conclusion, showing that socioeconomic hardship increases emotional distress, distractibility, and reduced academic

resilience (Ne'matzadeh Suteh et al., 2023). This interplay between socioeconomic status and psychological vulnerability further demonstrates the multifaceted nature of procrastination and reinforces the need for contextually grounded frameworks.

Taken together, the results demonstrate that academic procrastination among students in District 6 of Tehran is not the product of a singular cause but arises from the interplay of motivational, cognitive, emotional, familial, social, instructional, and technological factors. The model developed in this study aligns with global literature but contributes uniquely by highlighting how cultural, educational, and contextual elements in Tehran interact with students' internal processes. These findings underscore the importance of localized approaches for designing interventions that address the root causes of procrastination at personal, familial, and institutional levels.

This study was limited by its reliance on qualitative data derived from semi-structured interviews, which may reflect subjective perspectives rather than objective behavioral patterns. The sample was restricted to students in District 6 of Tehran, which limits generalizability to other educational districts or regions. The perspectives of parents, school administrators, or counselors were not included, and the findings rely solely on teacher and student interviews. Additionally, the cultural, socioeconomic, and instructional context may differ across school types, placing constraints on the transferability of the findings.

Future research could employ mixed-methods designs to combine qualitative insights with quantitative measurements of procrastination, motivation, and emotional variables. Expanding the sample across multiple educational districts and including diverse school types would enhance generalizability. Longitudinal studies could examine how academic procrastination evolves over time, especially during transitional periods such as entering secondary school or preparing for national exams. Additionally, future research could incorporate parents' and school counselors' perspectives to provide a more comprehensive understanding of contextual influences.

Teachers, school counselors, and administrators should emphasize development of self-regulatory skills, emotional coping strategies, and academic planning abilities among students. Schools should provide structured study-skills training, reduce overreliance on grade-based evaluation, and foster supportive learning environments. Parents can benefit from training programs that enhance constructive involvement without excessive control or comparison.

Educational policymakers should focus on designing curricula that reduce cognitive overload, integrate engaging teaching methods, and provide mental health support systems in schools.

Authors' Contributions

Authors equally contributed to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

All procedures performed in studies involving human participants were under the ethical standards of the institutional and, or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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