

# Cognitive Flexibility and Academic Procrastination Among University Students: The Serial Mediating Roles of Problem-Solving and Epistemological Beliefs

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## Research Article

**Keywords:** Cognitive Flexibility, Academic Procrastination, Epistemological Beliefs, Problem-solving, University Students

**Posted Date:** September 9th, 2026

**DOI:** <https://doi.org/10.21203/rs.3.rs-10604573/v1>

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**Additional Declarations:** No competing interests reported.

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# Abstract

Academic procrastination poses a potential threat to university students both emotionally and cognitively. The literature indicates correlations between cognitive flexibility, epistemological beliefs, problem-solving, and academic procrastination. However, these relationships need further study. The purpose of this paper is to reveal the mediating roles of epistemological beliefs and problem-solving in the relationship between cognitive flexibility and academic procrastination among university students. The participants were 286 university students in Türkiye. The results revealed a significant and negative relationship between cognitive flexibility and academic procrastination. The findings reveal that participants with high cognitive flexibility tend to procrastinate less academically, and that this skill may mitigate the negative outcomes of procrastination. Furthermore, epistemological beliefs and problem-solving skills mediate this relationship serially. The mediating roles, epistemological beliefs, and problem-solving skills can contribute to reducing academic procrastination. Accordingly, supporting cognitive flexibility, advanced epistemological beliefs, and effective problem-solving among university students can help reduce academic procrastination and improve the quality of students' academic lives.

## 1. Introduction

Academic procrastination is a common problem among students at all levels of education, particularly university students, and causes many physical and mental problems (Başpınar, 2020; Boffeli, 2007; Ferrari et al., 2009; Ferrari, 2010; Howell & Buro, 2009). According to Senecal et al. (1995), academic procrastination is characterized by individuals experiencing high levels of stress due to their inability to complete academic tasks on time, and then procrastinating further in response to that stress. Research has shown that academic procrastination has a significant negative impact on students' academic performance and is associated with various related variables such as low self-esteem, depression, low self-confidence, poor time management, resistance to control, peer influence, perfectionism, high levels of academic anxiety, irrational beliefs, and fear of failure (Knaus, 2002; Karla Silva Soares et al., 2022; Steel, 2007; Solomon & Rothblum, 1984). Academic procrastination, which refers to students intentionally delaying academic tasks that must be completed on time, such as tests, research, or university requirements, leads to poor grades, absenteeism, work accumulation, time pressure, delays, poor-quality work, and knowledge gaps, and may result in dropping out of a course or school (Başpınar, 2020; Schraw et al., 2007; Solomon & Rothblum, 1984). According to cognitive-behavioral theory, procrastination is not merely a simple case of task avoidance; it is a multidimensional phenomenon involving cognitive, emotional, and behavioral components (Ellis & Knaus, 1977; Knaus, 2010). Therefore, the present study examines cognitive flexibility, epistemological beliefs, and problem-solving skills, which are thought to be related to academic procrastination, a behavior frequently observed among university students.

Cognitive flexibility is defined as an individual's ability to adapt to specific conditions, shift from one thought to another (Stevens, 2009), generate options, and select the most appropriate option from among them (Anderson, 2002). A skill that enables an individual to develop cognitive process strategies

for new and unexpected situations in their environment (Canas et al., 2003). Individuals with low cognitive flexibility struggle to find alternative solutions and adapt to unexpected situations in life (Çuhadaroğlu, 2013; Dennis & Vander Wal, 2010), while those with high cognitive flexibility can focus on multiple tasks simultaneously, develop effective planning and problem-solving strategies; which can contribute to their better time management and reduction of academic procrastination (Yüksel et al., 2020). In addition to cognitive flexibility, another cognitive skill that is assumed to play a key role in academic procrastination is problem-solving ability (Yurtseven & Doğan, 2019).

A person with low problem-solving skills may adopt a strategy of avoiding failure and self-harm, which can lead to academic procrastination (Duru & Balkis, 2014). Completing academic tasks requires problem-solving skills. Those with high problem-solving skills may find academic tasks easier to complete, while those with low skills may struggle and resort to procrastination. Therefore, problem-solving skills have a significant impact on academic achievement and procrastination (Yılmaz, 2016). Students' beliefs about whether they will be successful or unsuccessful can also influence their subsequent motivation and effort (Dweck, 1986). As Jonassen (2000) also notes, one factor influencing an individual's approach to a problem is that individual's epistemological beliefs about the nature of problem-solving.

Epistemological beliefs express an individual's understanding of knowledge and knowledge acquisition and serve as a lens for distinguishing the nature, justification, and evaluation of knowledge (Hofer & Pintrich, 1997). According to Schommer's (1990) multidimensional epistemological belief model, students who believe that knowledge is certain and unchanging experience greater anxiety when faced with complex tasks, which can trigger procrastination (Howell & Buro, 2009; Kızılgunes et al., 2009). Studies have found that the nature of university students' epistemological beliefs is closely related to academic procrastination behavior (Boffeli, 2007; Ghufon & Suminta, 2022; Tuna & Osmanoğlu, 2024).

## **2. Theoretical framework**

### **2.1. Problem-solving**

According to D'Zurilla & Goldfried (1971), problem-solving is a cognitive and behavioral process that involves generating appropriate response options to address a problem situation and selecting the one predicted to be most effective from among the available options. In the problem-solving process, students' prior knowledge, the mental processes they use, and their perceptions of problem-solving all play important roles (Alcı et al., 2010). Mountrose (2000), who emphasizes the importance of emotions and beliefs in the problem-solving process, states that the problem-solving process consists of: defining the problem, identifying emotions related to the problem, revealing negative beliefs, transforming negative beliefs into positive beliefs, and visualizing the future. Individuals generally prefer to solve problems by drawing on their previous experiences and knowledge, even if they do not fully know the steps to follow (Toluk & Olkun, 2001). However, students who are unable to develop planned problem-solving strategies may resort to behaviors such as avoiding tasks, procrastinating, or avoiding

confronting the task when faced with challenging academic tasks in order to avoid failure and negative outcomes (Duru & Balkis, 2014; Glick & Orsillo, 2015; Yurtseven & Doğan, 2019). Insufficient problem-solving skills are an important factor contributing to individuals' procrastination behavior (Knaus, 1985). This is because when an individual lacks problem-solving skills, it can be a burden, whereas effective problem-solving requires them to think differently and flexibly (Jonassen, 2004). Limited research in this area has shown a negative relationship between problem-solving skills and academic procrastination. Indeed, Yılmaz (2016) found a significant and negative relationship between academic procrastination behavior and problem-solving and determined that problem-solving is a significant predictor of academic procrastination.

Academic procrastination behaviors, which cause many academic, physical, and psychological problems in students (Başpınar, 2020; Ekşi & Dilmaç, 2010; Grunschel et al., 2013), are closely related to problem-solving skills such as cognitive flexibility, which involves the ability to consider different solutions and perspectives (Spivack et al., 1976). Studies indicate a positive relationship between cognitive flexibility and problem-solving skills (Çelikkaleli, 2014; Rebetez et al., 2022). Research has found that individuals with high cognitive flexibility scores have a more positive attitude toward problems and use problem-solving strategies more effectively (Buğa et al., 2019). However, it has been determined that the absence or low level of cognitive flexibility can lead to various behavioral disorders in young people, especially academic procrastination problems (Khan et al., 2021; Yüksel et al., 2020). In conclusion, individuals' levels of cognitive flexibility directly affect their problem-solving skills, which in turn play a decisive role in academic procrastination behaviors. Individuals who can think flexibly and develop effective problem-solving strategies exhibit more constructive and determined behaviors when faced with academic tasks, thereby reducing procrastination.

## **2.2. Epistemological beliefs**

According to Hofer (2001), epistemological beliefs consist of beliefs about the definition of knowledge, how knowledge is constructed, how knowledge is evaluated, where knowledge is located, and how knowing occurs. Schommer (1990) emphasizes that epistemological beliefs consist of the dimensions of simple knowledge, certain knowledge, quick learning, and innate ability, and that individuals hold either sophisticated or naive beliefs within these four dimensions. A study found that students with undeveloped/immature epistemological beliefs tend to give up when faced with complex, difficult problems rather than thinking them through and trying to solve them, and that this situation negatively affects them (Aksan & Sözer, 2007). On the other hand, individuals with mature epistemological beliefs take responsibility for the process of acquiring knowledge, are more successful in controlling this process, believe in the benefits of education, and use qualified and varied cognitive information processing strategies in the learning process (Deryakulu & Büyüköztürk, 2005). Therefore, mature beliefs form the basis of cognitive flexibility and contribute to healthy decision-making and learning processes. Cognitive flexibility and epistemological beliefs may be related in many ways. This is because an individual's belief in change is related to their level of cognitive flexibility (Elen et al., 2011).

Research shows that epistemological beliefs are positively and significantly related to academic procrastination. Boffeli (2007) found that university students who adopt naive, less sophisticated, or immature personal epistemological beliefs tend to adopt more frequent and problematic academic procrastination. According to Tuna and Osmanoğlu (2024), university students' beliefs about effort in learning strengthen, and as they place greater importance on individual initiative regarding the quality, source, value, and access to information, the tendency toward academic procrastination decreases. However, when course assignments are perceived as difficult or challenging due to the complexity of the knowledge, epistemological beliefs may lead to academic procrastination in terms of starting or completing the work (Ghufron & Suminta, 2022). In conclusion, individuals with well-developed epistemological beliefs are less likely to procrastinate on academic tasks because they are more open to change and can think flexibly.

## **2.3. Present Study**

When reviewing the literature on the mediating roles of epistemological beliefs and problem-solving in the relationship between cognitive flexibility and academic procrastination, it was found that these variables were considered mediators in the studies. However, these studies have examined the relationships between problem-solving and epistemological beliefs (Aksan & Sözer, 2007; Hyytinen et al., 2014; Karadağ, Alpaslan, Yıldırım Şişman & Pekin İşeri, 2018), cognitive flexibility and academic procrastination (Yüksel et al., 2020; Khan, I., Schommer-Aikins & Saeed, 2021). However, no study in the literature has been found that examines problem-solving and epistemological beliefs as mediators within the same model in the relationship between university students' cognitive flexibility and academic procrastination. Cognitive flexibility, problem-solving skills, and epistemological beliefs play a crucial role in preventing academic procrastination, which is commonly observed among university students (Ferrari et al., 2009). Findings from previous studies indicate that a lack of cognitive flexibility is associated with increased academic procrastination (Khan et al., 2021; Steel & König, 2006; Yüksel et al., 2020). On the other hand, when problem-solving skills (Buğa et al., 2019) and epistemological beliefs (Boffeli, 2007) are underdeveloped, individuals may be more likely to exhibit academic procrastination. In conclusion, cognitive flexibility can significantly influence problem-solving skills, epistemological beliefs, and academic procrastination behaviors. This study uniquely highlights the role of cognitive flexibility and proposes a serial mediation model, suggesting that epistemological beliefs and problem-solving mediate the relationship between cognitive flexibility and academic procrastination.

H<sub>1</sub>: Cognitive flexibility has a significant negative effect on academic procrastination.

H<sub>2</sub>: Epistemological beliefs and problem-solving sequentially mediate the relationship between cognitive flexibility and academic procrastination, such that cognitive flexibility predicts more advanced epistemological beliefs, which predict stronger problem-solving skills, which in turn predict lower academic procrastination.

## **3. Methodology**

This section of the paper provides information on the participants, data collection tools, data analysis, and findings.

## **3.1. Participants and Procedure**

In this paper, the researcher used convenience sampling, although this approach has some generalizability limitations (Andrade, 2021). Accordingly, he utilized Google Forms to collect the data. The data collection link was shared with participants via class groups, and participation was voluntary. The form did not allow missing data; therefore, 286 participants from different universities in Türkiye filled the form thoroughly. The participants were undergraduate university students. The average age was 20.98 (SD = 2.60; range = 17–24). Most participants were first graders (n = 97; 33.9%), followed by third graders (n = 80; 28.0%), fourth graders (n = 69; 24.1%), and second graders (n = 40; 14.0%). The majority of participants studied classroom teaching (n = 96; 33.6%).

## **3.2. Measures**

### **3.2.1. Academic Procrastination Scale (AP)**

The short form of the academic procrastination scale, consisting of 5 items, was developed by McCloskey (2011) and adapted into Turkish by Balkis and Duru (2021). The five-point single-factor Likert-type scale has response options ranging from "strongly agree" to "strongly disagree" and has no reverse-coded items. Higher scores indicate higher academic procrastination. Sample item from the scale: "When given an assignment, I usually put it away and forget about it until it is almost due." The scale is also highly reliable, with an alpha value of 0.88. Fit values (RMSEA = 0.04;  $\chi^2/df$  = 1.45; NFI = 0.99; TLI = 0.99; CFI = 1; SRMR = .02; GFI = 0.99; RFI = .98) indicate that the adapted form is quite appropriate for the Turkish sample.

### **3.2.2. Cognitive Flexibility Scale (CF)**

The cognitive flexibility scale, consisting of 12 items, was developed by Martin and Rubin (1995) and adapted into Turkish by Altunkol (2011). The six-point Likert-type adapted scale, consisting of two factors, has response options ranging from "Definitely Agree" to "Definitely Disagree" and an alpha value of 0.81. Higher scores indicate higher cognitive flexibility. Sample item from the scale is "I can communicate an idea in many different ways."

### **3.2.3. Epistemological Beliefs Scale (EB)**

The epistemological beliefs scale developed by Schommer (1990) and adapted into Turkish by Deryakulu and Büyüköztürk (2002) consists of three sub-dimensions and 35 items. Later, in the validity and reliability analysis conducted by Aydın et al. (2017), the number of items was reduced to 23. In this study, the 23-item form of the scale was used. The scale contains 3 subscales. Sample item from the scale is "People who challenge authority are over-confident." Higher scores from the scale indicate firmer epistemological beliefs. While the original scale comprised four factors, the adapted form comprised

three. The adapted version had 23 items and explained %45 of the variance. As for reliability, the scale had item-total correlations ranging from 0.394 to 0.801, and alpha values of 0.88, 0.88, and 0.85 for the factors. Fit values for the scale are:  $\chi^2/df = 4.41$ ; RMSEA= .005; NFI=.95; NNFI = 0.96; CFI=.96; GFI=.90; AGFI = 0.88.

### 3.2.4. Problem-Solving Styles Scale (PS)

The problem-solving styles scale, consisting of 14 items, was developed by Romero et al. (1992) and adapted into Turkish by Arslan et al. (2016). A sample item from the scale is "I tend to approach problem-solving in a creative and imaginative manner." The scale has an alpha value of 0.78. The item-total correlations range between 0.47 and 0.66. Fit values for the scale are;  $\chi^2 = 146.40$ ,  $df = 76$ , RMSEA = .06, NFI = .92, AGFI= .89, CFI = .96, IFI = .96, and SRMR = .057.

## 3.3. Data Analysis

In addition to examining the correlations among Cognitive Flexibility (CF), Academic Procrastination (AP), Epistemological Beliefs (EB), and Problem-solving (PS), this paper examined the serial mediating roles of "Epistemological Beliefs" and "Problem-solving" between "Cognitive Flexibility" and "Academic Procrastination". During the analyses, IBM SPSS Statistics 23 and SmartPLS 3 (Ringle et al., 2015) were used. SmartPLS is a handy program that is ideal for small samples, user-friendly, widely used across several disciplines, and does not require normality assumptions (Sander & Lee, 2014).

## 4. Results

### 4.1. The Measurement Model

The initial analysis indicates that CF has a mean score of 4.33 ( $\pm 0.55$ ), AP has a mean score of 2.79 ( $\pm 0.94$ ), EB has a mean score of 3.23 ( $\pm 0.34$ ), and PS has a mean score of 4.61 ( $\pm 0.46$ ). There are also significant correlations between the variables. Table 1 shows the correlations between the variables.

Table 1  
The Correlations & Descriptives

| 1. CF     | 1      | 2      | 3      | 4 |
|-----------|--------|--------|--------|---|
|           | -      |        |        |   |
| 2. EB     | 0.17*  | -      |        |   |
| 3. PS     | 0.58*  | 0.21*  | -      |   |
| 4. AP     | -0.49* | -0.14* | -0.40* | - |
| *p < 0.01 |        |        |        |   |

The highest correlation is between PS and CF ( $r = 0.58$ ). Conversely, the weakest correlation is between EB and AP ( $r = -0.14$ ). Considering the correlations, the researcher created the model and the following

hypotheses. On the other side, common method bias (CMB) might be a serious issue for self-report measures. Therefore, the researchers conducted Harman's single-factor test. The results indicated that the first factor explained 20.51% of the total variance, which was acceptable, and common method bias was not a concern in this study (Podsakoff et al., 2003).

Before the hypothesis testing, to check the validity and reliability of the data collection tools, the researcher used SmartPLS 3 (Ringle et al., 2015). Accordingly, "Internal Consistency" ( $\alpha$ ), "Variance Inflation Factor" (VIF), and "HTMT" outputs are available in Table 2 below.

Table 2  
Validity & Reliability

| The Measure |          | HTMT |      |      |      |
|-------------|----------|------|------|------|------|
| VIF         | $\alpha$ | AP   | CF   | EB   | PS   |
| 1.57–2.34   | 0.86     | AP   |      |      |      |
| 1.22–1.71   | 0.80     | CF   | 0.57 |      |      |
| 1.36–2.23   | 0.70     | EB   | 0.22 | 0.58 |      |
| 1.07–1.81   | 0.77     | PS   | 0.53 | 0.86 | 0.57 |

Alpha values, indicating the internal consistency of a data collection tool, above 0.65 are acceptable (Bonett & Wright, 2015; Vaske et al., 2017). The variance inflation factor (VIF) tests collinearity (Liao & Valliant, 2012). VIF values indicate the interdependence among variables, and values below 5 are acceptable (Akinwande et al., 2015). To test discriminant validity, the HTMT ratio technique was used, and values below 0.90 are acceptable (Gold et al., 2001; Henseler et al., 2015; Rasoolimanesh, 2022; Sarstedt et al., 2022). Considering the abovementioned criteria, the data collection tools are both valid and reliable.

## 4.2. The Structural Model

The analysis was conducted using SmartPLS3 (Ringle et al., 2015). It is hypothesized that "Epistemological Beliefs (EB)" and "Problem-solving (PS)" mediate the relationship between "Cognitive Flexibility (CF)" and "Academic Procrastination (AP)" in a serial manner. Utilizing the 5000-subsample bootstrapping method and %95 bias-corrected confidence intervals, the structural model has been tested considering confidence intervals (CI),  $R^2$ , and  $\beta$  values. Based on the literature, the researcher included the direct paths between CF & AP; CF & EB; EB & PS; and PS & AP in the analysis, and the results indicated that the direct path between CF and AP was significant ( $\beta = -0.31$ ,  $p < .001$ ), revealing partial mediation. The analysis also included  $R^2$  values (AP = 0.27; EB = 0.33; PS = 0.34), indicating how well the regression fits the model (Nagelkerke, 1991; Latif et al., 2020), and Q2 values (AP = 0.16; EB = 0.06; PS = 0.09), indicating the model's predictive relevance (Hair et al., 2019). The researcher also checked  $f^2$  values for effect size, and the results indicated that CF had a large effect on EB ( $f^2 = 0.49$ ), EB

had a large effect on PS ( $f^2 = 0.53$ ), CF had a small effect on AP ( $f^2 = 0.06$ ), PS had a small effect on AP ( $f^2 = 0.04$ ) (Cohen, 1988). Detailed output to the mediation analysis is available in Table 3.

Table 3  
Mediation Results

| Type of Effect            |                | $\beta$ | Std  | t    | p    | CI            |
|---------------------------|----------------|---------|------|------|------|---------------|
| Direct Effect             | CF->AP         | -0.31   | 0.07 | 4.45 | 0.00 | -0.44 / -0.16 |
| Specific Indirect Effects | EB->PS->AP     | -0.14   | 0.04 | 3.60 | 0.00 | -0.22 / -0.06 |
|                           | CF->EB->PS->AP | -0.08   | 0.02 | 3.27 | 0.00 | -0.13 / -0.03 |
|                           | CF->EB->PS     | 0.34    | 0.03 | 8.77 | 0.00 | 0.25 / 0.40   |
| Total Indirect Effects    | CF->AP         | -0.08   | 0.02 | 3.27 | 0.00 | -0.13 / -0.03 |
|                           | CF->PS         | 0.34    | 0.03 | 8.77 | 0.00 | 0.25 / 0.40   |
|                           | EB->AP         | -0.14   | 0.04 | 3.60 | 0.00 | -0.22 / -0.06 |
| Total Effect              | CF->AP         | -0.39   | 0.05 | 7.62 | 0.00 | -0.49 -0.28   |

The mediation analysis indicates that the serial mediating effect of EB and PS on CF and AP is significant ( $\beta = -0.08$ ,  $p < 0.001$ ). The path model is in Fig. 1.

## 5. Discussion

The present study reveals a negative relationship between cognitive flexibility and academic procrastination. Furthermore, epistemological beliefs and problem-solving mediate the relationship between cognitive flexibility and academic procrastination. These findings show that there is a negative association between university students' cognitive flexibility and academic procrastination outcomes, while also highlighting the potential mitigating roles of cognitive flexibility, epistemological beliefs, and problem-solving in this context. In this context, research findings support contemporary models that argue that the circumstances causing procrastination are multidimensional in nature, and that interventions focusing on cognitive-behavioral techniques, teacher- and school-based interventions, and peer support consistently reduce academic procrastination rates and increase academic achievement (Ellis & Knaus, 1977; Knaus, 2010; van Eerde & Klingsieck, 2018; Xu, 2016; Yockey, 2016). These findings are particularly important for university students from a practical perspective.

The study's findings primarily show that cognitive flexibility is a significant, negative predictor of academic procrastination, a common problem among university students. This finding supports previous research indicating that individuals with high cognitive flexibility tend to exhibit lower levels of academic procrastination (Imran et al., 2025; Yüksel et al., 2020). In one study, students with appropriate cognitive flexibility were found to be able to evaluate situations in multiple ways, such as analyzing in depth, evaluating alternatives, and selecting appropriate strategies in the face of unfamiliar challenges

(Samadieh & Nasri, 2021). In this context, cognitive flexibility can be considered an important preventive factor in overcoming situations that cause problems for individuals, such as academic procrastination, which can lead to various distressing conditions. Procrastination can lead to increased stress levels in individuals, which can cause a wide range of problems, including reduced productivity, insomnia, fatigue, poor nutrition, lack of exercise, and low self-esteem, which can affect the immune system, increase susceptibility to disease, impair overall health, and affect the quality of students' academic life (Furlan & Cristofolini, 2022; Herut & Gorf, 2024). Previous studies have shown that cognitive flexibility is a strong resilience factor in the face of these problems (Altan-Atalay & Boluvat, 2024; Inozu et al., 2022). A review of the literature reveals a bidirectional relationship between cognitive flexibility and academic procrastination. Indeed, some studies show that an increase in academic procrastination is negatively correlated with students' cognitive flexibility. Altunkol's (2011) study found that as university students' stress and anxiety levels increased, academic procrastination increased and cognitive flexibility decreased. Khan et al. (2021) determined that avoiding procrastination positively contributes to individuals' adoption of cognitive flexibility. The results of this study also indicate that cognitive flexibility is negatively associated with academic procrastination. Accordingly, cognitive flexibility can play a protective role in reducing procrastination by helping individuals cope with stress and challenges. Furthermore, it is emphasized that procrastination may be negatively associated with an individual's health and quality of life, and therefore, fostering cognitive flexibility is important.

Another finding of the paper is that epistemological beliefs and problem-solving have been identified as important mediating factors in the relationship between cognitive flexibility and academic procrastination in university students. Although no studies in the literature examine the mediating role of epistemological beliefs in the relationship between cognitive flexibility and academic procrastination, the current study shows that epistemological beliefs are related to both cognitive flexibility and academic procrastination. One of the prerequisites for cognitive flexibility is the development of epistemological beliefs (Roex et al., 2011; Schommer-Aikins, 2011). The beliefs and attitudes that individuals hold may be related to the decisions they make and the behaviors they exhibit throughout their lives (Pajares, 1992; Brown & Cooney, 1982; Taşkın, 2012). If students believe that their abilities are fixed, they tend to procrastinate on academic tasks; however, if they believe that abilities are changeable, they do not tend to procrastinate (Howell & Buro, 2009). Research has shown that university students with mature or sophisticated epistemological beliefs exhibit less frequent and less problematic academic procrastination behaviors (Boffeli, 2007; Ghufon & Suminta, 2022; Tuna & Osmanoğlu, 2024).

On the other hand, problem-solving skills have been identified as an important mediating factor in the relationship between cognitive flexibility and academic procrastination among university students. Problem-solving skills have been identified as an important mediating factor in the relationship between cognitive flexibility and academic procrastination, a finding supported by recent studies (Buğa et al., 2019). Problem-solving skills, which involve being aware of situations that cause discomfort to the individual, selecting the most appropriate alternative to overcome problems, and reaching a solution, can be said to serve as an important mechanism for overcoming academic procrastination. Limited research in this area has shown that weak problem-solving skills increase the tendency to make procrastinatory

decisions, and that this tendency is significantly related to academic procrastination behavior (İlge et al., 2015; Sadeghi et al., 2011). Yılmaz (2016) found a significant negative relationship between academic procrastination and problem-solving and determined that problem-solving is a significant predictor of academic procrastination. Another study found a significant positive relationship between problem-solving skills and cognitive flexibility. Individuals with high problem-solving levels also exhibit more flexible cognitive characteristics. It can be said that the skills individuals use to solve problems and their cognitive flexibility skills are similar and complementary (Taş & Deniz, 2018). For individuals to demonstrate their skills across all areas and overcome problems, they need cognitive flexibility and effective problem-solving skills (Çelikkaleli, 2014; Rebetz et al., 2022).

In conclusion, cognitive flexibility levels play a critical role in the relationship between problem-solving skills and academic procrastination, as they affect university students' ability to cope with the difficulties they encounter in their academic lives and to minimize procrastination behaviors. Since the problem-solving process involves cognitive and behavioral stages such as identifying distressing situations, generating alternative solutions, and implementing the most effective option, deficiencies in these skills may increase the tendency to make procrastinatory decisions.

## 6. Conclusion

This study revealed a significant and negative relationship between cognitive flexibility and academic procrastination. In addition, problem-solving skills and epistemological beliefs were found to mediate this relationship. The findings show that individuals with high cognitive flexibility tend to procrastinate less and that this skill acts as a protective factor against the negative effects of procrastination. Epistemological beliefs and problem-solving skills shape individuals' attitudes toward the learning process, thereby reducing academic procrastination behavior. Therefore, promoting cognitive flexibility, advanced epistemological beliefs, and effective problem-solving among university students can help reduce academic procrastination and improve the quality of students' academic lives.

### Limitations

The findings in this paper have several limitations that need to be considered when interpreting the results. First, the use of convenience sampling may limit the generalizability of the results to the broader population. Second, the sample was characterized by a gender imbalance, with female participants outnumbering male participants. This gender distribution could have influenced the findings and should be considered when interpreting the results. Moreover, the relatively wide age range of the participants (17–24) may reflect differences in academic and cognitive experiences, which could have affected the observed relationships among the variables. Future research should employ more balanced, representative samples by gender and age to enhance the generalizability of the findings. Lastly, cognitive flexibility, epistemological beliefs, and problem-solving skills are based on university students' self-assessments of their academic procrastination behaviors. This may be influenced by students'

social acceptance and the likelihood of bias in their responses. Since this is a cross-sectional study, it is not meaningful to establish causal relationships between variables.

## Implications

The present study suggests that cognitive flexibility, epistemological beliefs, and problem-solving skills may be effective intervention strategies for university students who exhibit academic procrastination. Increasing the cognitive flexibility of Turkish university students, developing their problem-solving skills, and raising their epistemological beliefs may help prevent the negative consequences of academic procrastination (Buğa et al., 2019; Tuna & Osmanoğlu, 2024). Creating support mechanisms that foster cognitive flexibility, problem-solving skills, and epistemological beliefs among Turkish university students and increasing their cognitive flexibility and problem-solving capacities may help eliminate the negative factors associated with academic procrastination. In this context, the effectiveness of approaches such as Cognitive Behavioral Therapy (Ellis & Knaus, 1977; Knaus, 2010) and Temporal Motivation Theory (Steel & König, 2006) can be tested. On the other hand, based on these findings, preventive interventions targeting the causes of academic procrastination should focus on fostering a supportive and inclusive school environment, participating in programs to increase cognitive flexibility and problem-solving skills, and encouraging the development of positive peer relationships and communication skills. These interventions can help individuals develop resilience and coping strategies to mitigate the negative effects of academic procrastination on university students.

## Declarations

**Ethical Approval:** The study protocol has been approved by Necmettin Erbakan University Scientific Research and Ethical Review Board (Report Number:2025/389). The study was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its following updates.

**Consent to Participate:** Informed consent was obtained from all the participants included in the study.

**Consent for Publication:** The author gives his consent for publication.

**Consent to Publish:** Informed consent to publish this material was obtained from all individual participants included in the study.

**Data Availability:** Data will be available at a reasonable request.

**Competing Interests:** No competing interests exist for any person of this manuscript.

**Funding:** The author received no financial support for this article's research, authorship, and/or publication.

**Acknowledgements:** N/A

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## Figures

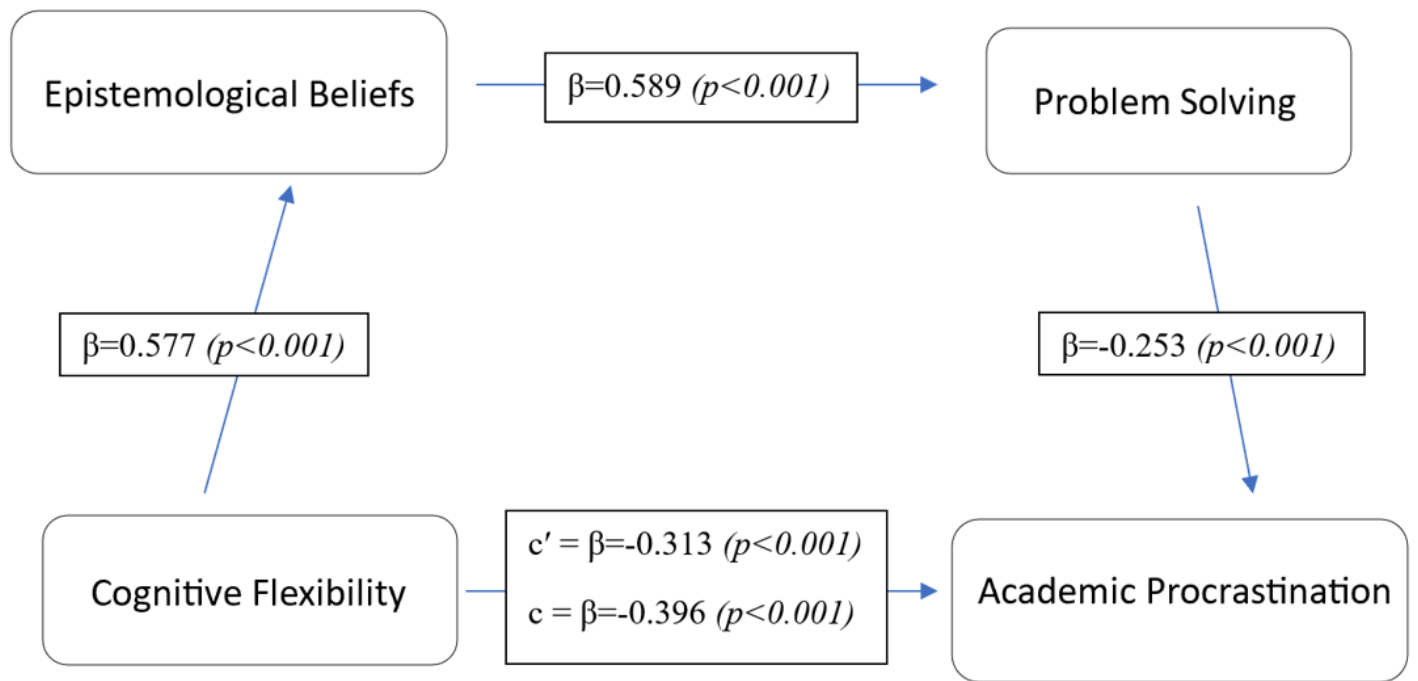


**Figure 1**

The path model