



Research Paper: The Correlation between Metacognitive Beliefs and Academic Performance in Students: Mediating Role of Learning Styles



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Abstract

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Objective: Academically successful students may expect higher performance in their next projects, volunteer work, and study sessions. Consequently, the primary emphasis of educational experts has always been elements impacting academic performance. This article examined the mediating effect of learning styles in the interaction between metacognitive viewpoints and students' academic achievement.

Methods: This was descriptive, correlational study. Total number of female high school students in Astaneh Ashrafieh was 1,211. Random sampling enabled a cohort of 291 students to be chosen. Data were obtained with Academic Performance Questionnaire, Metacognitive Beliefs Questionnaire (MCQ) and Learning Style Orientation Measure (LSOM). Data analysis included structural equation modeling applied using SPSS-22 and Smart PLS 3.2.9 tools and correlation testing.

Results: The findings revealed that indirectly, metacognitive views influenced academic performance by means of learning techniques. Moreover, academic performance revealed rather strong and unambiguous links between metacognitive perspectives and learning techniques ($p < .05$).

Conclusion: Improved metacognitive views among students assist them to plan, define precise targets, track their learning activities and academic growth, and identify their strengths and flaws. Improving academic success and preventing academic failure depend on one focusing on the influence of metacognitive aspects and students' learning styles. At last, this study underlines how much learning techniques and metacognitive attitudes affect academic performance. The results reveal that by developing metacognitive abilities and appreciating various learning approaches, teachers may support their students in obtaining their academic goals quite efficiently.

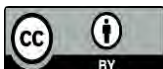
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1. Introduction

Academic performance of students has been seen as a major indicator for assessing educational systems; all the efforts and actions of this system are in reality geared at accomplishing this goal (Saadipour et al., 2019). Measured with the help of teacher-made or standardized tests, academic performance—as used in relation to academic disciplines and themes—is the learnt and acquired competence of students (Talsma et al., 2019). When problems like academic failure and low academic performance emerge in an educational system, several motivational, cognitive, psychological, and environmental aspects are found as the causes of this negative performance (Marengo et al., 2019).

One of the issues that has gained the attention of academics and instructors lately is the different learning styles of students. Kolb (1984) argues that a more broad concept—that of personality—is composed of elements including learning style. The mysterious relationship between personality and cognition controls not just the overall learning process but also the specific approach people select in addressing challenges (Ramzani Garmi, 2022). People's learning style is defined by their beliefs, convictions, preferences, and activities they use to help in their own learning in a given environment (Husmann & O'Loughlin, 2019). Students approach their studies differently. Stated differently, students filter content through numerous lenses (Rezai Rafi & Rezai Manesh, 2018). Kolb's theory of learning styles holds that pupils achieve

academic achievement when they can fit their learning style with the environment (Taleb, 2021). Considering the differences in learning styles, knowledge in this field helps teachers to be able to use various kinds of instruction in the classroom in a systematic way, thus surely this will improve the quality of learning in learners since the impact of learning style itself can have a wide and significant influence on the effectiveness and efficiency of education. Alizadeh and Yahek (2022) revealed in a research that self-regulated learning has a major influence in the relationship between metacognitive beliefs and academic procrastinating; the three components of positive beliefs about worry, cognitive confidence, and cognitive self-awareness with academic procrastination are negative and significant with the regard of self-regulated learning. Mousavi (2022) claims that research shows a clear link in academic success, responsibility, and motivation. Students with auditory, visual, and practical learning styles showed quite diverse academic performance and academic year according to Linca and Matei's (2024) research.

According to Taherzadeh Ghafarakhi et al. (2022), metacognitive views are people's ideas and beliefs about their own cognition, according to Wells (2001). The psychological frameworks, expertise, and procedures involved in managing, adjusting, and interpreting thoughts are referred to as metacognition. In actuality, metacognition is the mental experiences associated with people's behaviors and is a collection of knowledge that an individual possesses about their cognitive system (Shafiei &

Sharifzadeh, 2019). According to Wells (2011/2015), people's ideas—also known as metacognitive beliefs or knowledge—about their thoughts have the power to affect their emotions and moods (Abdulahi & Davoudi, 2017). Students' academic performance may be improved, and they can also be given the chance to properly identify their own strengths and weaknesses by developing their metacognitive views. Students that hold metacognitive beliefs will be better at processing information, which will improve their academic performance and lessen their propensity to retreat and put things off (Alizadeh & Yahek, 2022). When students have a clear understanding of their own talents, they can learn as much as possible successfully.

According to Cai et al. (2019), students utilize metacognitive methods when confronted with difficulties resulting from task performance; these strategies help to shape their goals. Studies by Ziegler and Opendakker (2018) and Cikrikci (2016)

subtly shown that academic procrastination might be predicted by metacognitive beliefs.

Considering individual differences among students in terms of metacognitive beliefs, efforts should be made to offer better learning conditions for successful academic performance since students are the greatest human capital of any society and given the relevance of academic performance in students' future career and personal life. By means of the identification of the link between the elements of metacognitive beliefs and the choice of learning strategies of students, an efficient step can be taken to improve their academic performance so enabling them to continue their education at higher levels and attain career success. This will help to ensure different academic performance. The present study sought to address the question: Is there a relationship between metacognitive beliefs and academic performance with the mediation role of learning —styles? Given very little research on this topic in Iran.

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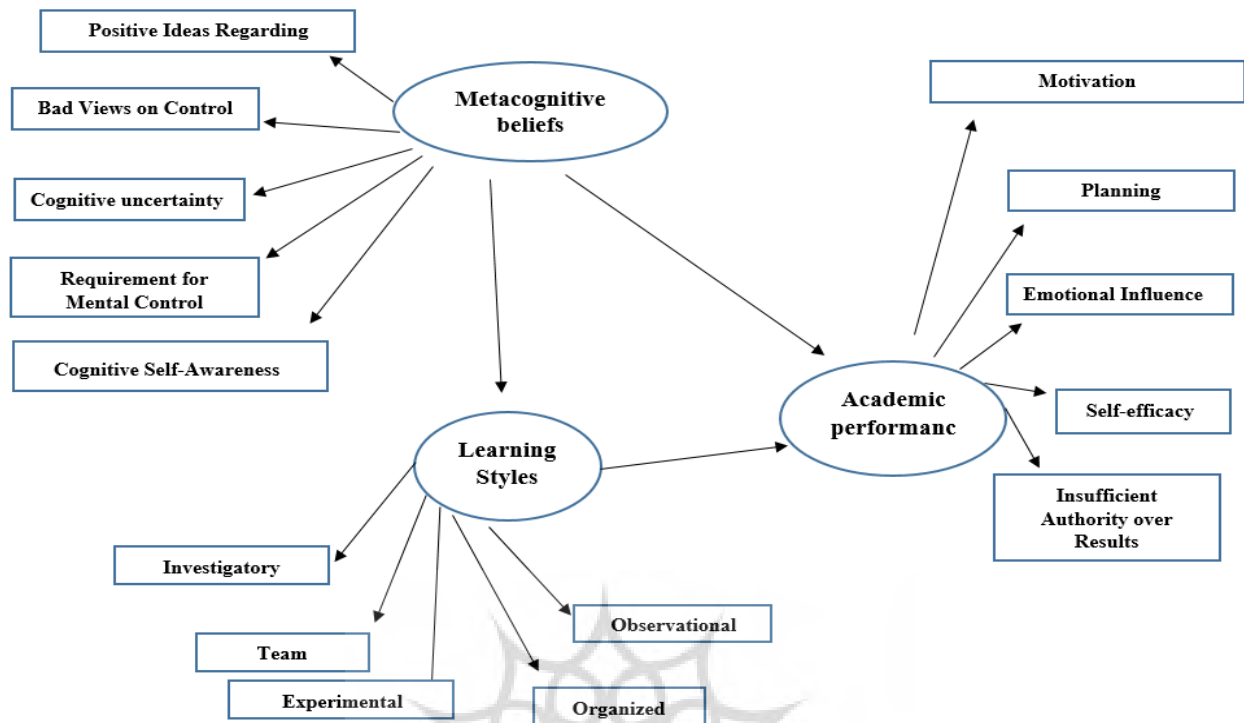


Diagram 1
Research Conceptual Model

2. Methods

2.1. Research Design, Statistical Population, Sample, and Sampling Method

Using correlation and structural equation modeling, this was a correlational study with an analysis of the relationships between the research variables.

The study's statistical population comprised 1211 female high school students from Astane Ashrafieh city who were enrolled in the academic years 2023–2024. Using the Krejcie and Morgan table, chosen through stratified random sampling according to the school population and grade level, the sample size was projected to be 292 based on Cochran's calculation.

2.2. Instruments

Educational Performance Questionnaire: Pham and Taylor created this quiz back in 1999. Using a five-point Likert scale (none, low, moderate, high, and very high), this 48-item questionnaire assesses academic performance in a number of areas, including self-efficacy (questions 29 to 36), emotional impacts (questions 12 to 19), planning (questions 1, 2, 3, 4, 8, 9, 10, 11, 40, 43, 44, 45, 46, 48), lack of outcome control (questions 5, 6, 7, 37, 38), and motivation (questions 20, 21, 22, 23, 24, 25, 26, 27, 28, 39, 41, 42, 47). Furthermore, questions 26 and 33 have different scores. Number 7 receives no points. Higher scores indicate greater academic success and vice versa. The

score range is 0 to 240. Using the Cronbach's alpha approach, [Fam and Taylor \(1999\)](#) obtained a reliability of 0.79 and supported the content validity of the instrument. Professors' views were used in [Dortaj's \(2004\)](#) research to validate content validity, and component analysis—which revealed the presence of five factors—supported construct validity. The reliability, as determined by the Cronbach's alpha technique, was 0.74 for the overall scale score and 0.92, 0.73, 0.93, 0.64, and 0.73 for the dimensions of motivation, self-efficacy, planning, emotional affects, and lack of outcome control.

Learning Style Orientation Measure (LSOM): Designed by [Towler and Dipboye in 2003](#), this questionnaire has five subscales—exploratory learning styles (items 1–14), group learning styles (items 15–21), experiential learning styles (items 22–34), structured learning styles (items 35–45), and observational learning styles (items 46–54). There are 54 items total. A 7-point Likert scale runs responses from "strongly disagree" to "strongly agree." Cronbach's alpha calculated the questionnaire's dependability to be 0.97 ([Huang et al., 2023](#)), while its construct validity came out to be 0.84. For the Iranian sample, [Yurdkhani et al. \(2023\)](#) noted a Cronbach's alpha of 0.70.

Metacognitive Beliefs Questionnaire (MCQ): The 30-item [Wells and Cartwright's \(2004\)](#) questionnaire evaluates metacognitive beliefs; so, in this study, people's opinions on their thinking were investigated using this four-point Likert scale: strongly disagree, slightly agree, moderately agree, and strongly agree. The aforementioned questionnaire has five

subscales: questions 28, 23, 19, 10, 7, and 1 evaluate positive beliefs about worry; questions 21, 15, 11, 9, 4, and 2 evaluate negative beliefs about the controllability of thoughts and associated risks of worry; questions 29, 26, 24, 17, 14, and 8 evaluate cognitive uncertainty; questions 27, 25, 22, 20, 20, 13, and 6 evaluate the necessity of controlling thoughts; and questions 30, 18, 16, 12, 5, and 3 evaluate cognitive self-awareness metacognitive processes. [Wells and Cartwright \(2004\)](#) reported that Cronbach's alpha coefficients for the overall scale and subscales ranged from 0.87 to 0.59 for the former and from 0.93 to 0.76 for the latter depending on dependability. For the overall scale, the Cronbach's alpha coefficient of the Iranian sample was found to be 0.91; for the subscales of uncontrollability, positive beliefs, metacognitive awareness, cognitive confidence, and desire to regulate thoughts, respectively, it was 0.87, 0.86, 0.81, and 0.71 ([Shirinzadeh Dastagari, 2006](#)).

2.3. Data Collection Procedure

They were given the research tools, which included metacognitive views, learning styles, and academic performance questionnaires on these areas. Out of the 292 questionnaires given to the students, 35 were not returned and 7 were eliminated from the study for incompleteness, therefore leaving 250 questionnaires for investigation. The students were guaranteed that the questionnaires were anonymous and that the results would be examined collectively, therefore observing ethical issues; all students engaged in the study with informed permission.

2.4.Data analysis Procedure

While inferential statistics were used at a significance level of ($P < 0.05$) for the Pearson correlation test, path coefficients, and structural equation modeling, descriptive statistics were applied in the data analysis process to create frequency, percentage, and mean for the variables.

3. Results

The survey involved 250 female students overall; the 17-year-old age group accounted for 46.8% of the total participation frequency. Academic subjects were distributed as follows: 16.4% humanities, 12.8% experimental sciences, 2.8% mathematics, 18% graphics, 26.8% design and sewing, 11.6% architecture, and 11.6% accountancy. With 58.4% of all students in the 12th grade, this was the most often occurring grade.

Table 1
Mean and standard deviation of research variables

Variable	Mean	Standard Deviation
Planning	3.16	1.16
Insufficient Authority over Results	3.26	1.16
Emotional Influence	3.20	1.16
Motivation	3.21	1.15
Self-efficacy	3.19	1.15
Academic Performance	3.20	1.12
Investigatory	4.22	1.61
Team	4.17	1.63
Experiential	4.20	1.58
Organized	4.18	1.62
Observational	4.18	1.62
Learning Styles	4.19	1.56
Positive Ideas Regarding Anxiety	2.49	0.93
Bad Views on Control	2.54	0.93
Cognitive uncertainty	2.47	0.97
Requirement for Mental Control	2.51	0.91
Cognitive Self-Awareness	2.52	0.95
Metacognitive Beliefs	2.51	0.90

Based on the mean scores of the dimensions of the academic performance variable, [Table 1](#) shows that the dimension of "lack of control over consequences," has the greatest average; the dimension of

"planning," has the lowest average. Likewise, depending on the average scores of the several dimensions of the learning styles variable, the 'group' dimension has the lowest average and the 'exploratory' dimension has

the greatest average. At last, the dimension of "negative views about control" has the greatest average based on the average scores

of the dimensions of the metacognitive beliefs variable; the dimension of "cognitive uncertainty" has the lowest average.

Table 2
Variables' correlation coefficient

	Academic Performance
Positive Ideas Regarding Anxiety	0.94**
Bad Views on Control	0.94**
Cognitive uncertainty	0.94**
Requirement for Mental Control	0.94**
Cognitive Self-Awareness	0.94**
Metacognitive Beliefs	0.97**
Investigatory	0.96**
Team	0.94**
Experiential	0.97**
Organized	0.96**
Observational	0.95**
Learning Styles	0.98**

** p ≤ 0.01

Table 2 shows a substantial link between metacognitive beliefs and learning styles and academic performance (P<0.05). With regard to the sign of the correlation coefficient, the association between metacognitive beliefs

and learning styles with academic performance is positive and notable (P<0.05). This implies that academic performance rises along with metacognitive views and learning styles as they do.

Table 3
Direct effects between variables

	Path	T	B	Relationship	Conclusion
Metacognitive Beliefs → Academic Performance		2.445*	0.163	Positive	Approved
Learning Styles → Academic Performance		4.913*	0.439	Positive	Approved

*: At the 0.05 level the effect is notable.

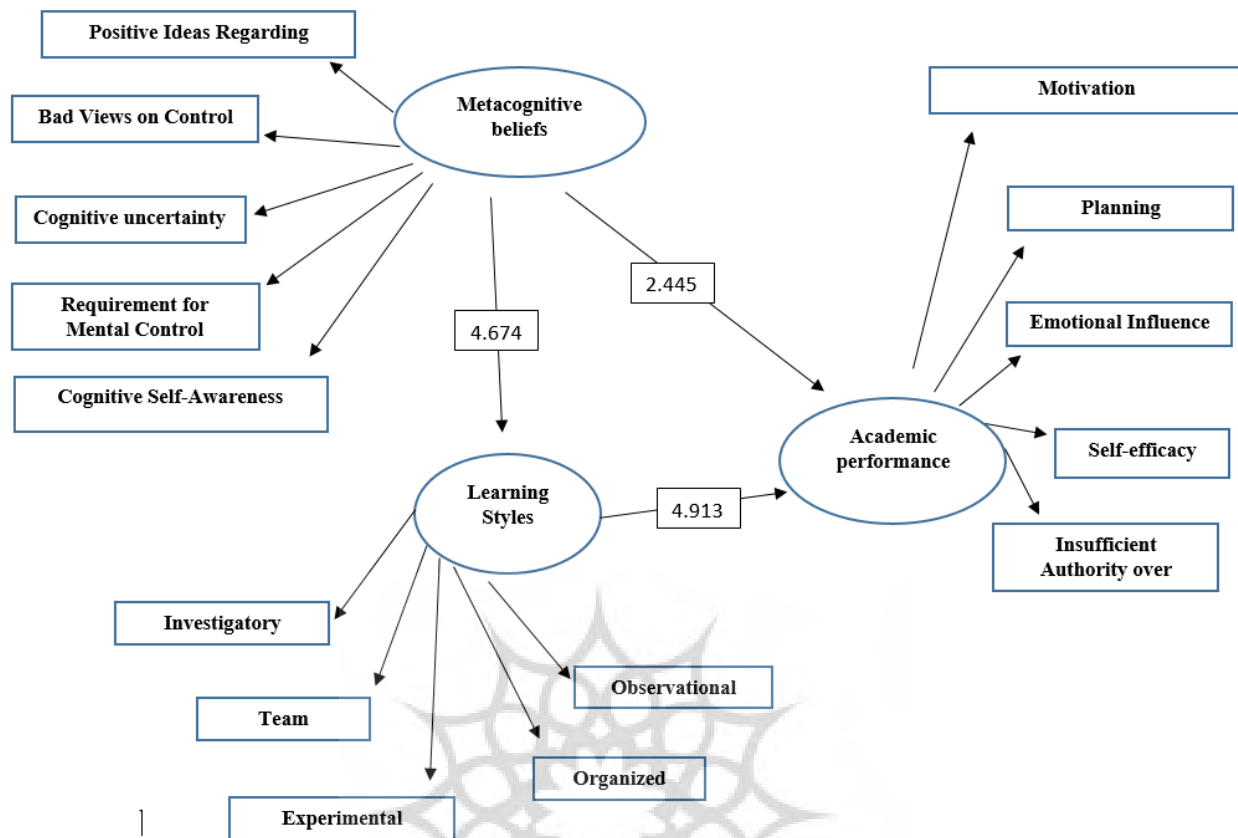


Diagram 2

Model variable absolute value of the t-statistic

Learning styles and academic performance have a noteworthy correlation since the absolute value of the t-statistic in the link between them (4.913) exceeds the minimum significant value of 1.96 (Table 3). Furthermore, the path coefficient of 0.439 shows that the component of learning styles directly explains almost 43% of the variability in academic performance. Learning styles and academic success thus have a good and notable relationship. Stated differently, the academic performance index greatly rises as the component of learning styles rises. As so, the second hypothesis is validated.

There is a notable link between metacognitive beliefs and academic performance since the absolute value of the t-statistic in the relationship between them (2.445) is more than the minimum significant value of 1.96 (Table 3). Furthermore, the path coefficient of 0.163 shows that the component of metacognitive beliefs directly explains almost 16% of the fluctuations in academic performance. Thus, academic performance and metacognitive views have a favorable and noteworthy correlation. Stated otherwise, the academic performance index rises noticeably as the component of metacognitive beliefs rises.

Table 4
Indirect Interactions Among Variables

Path	<i>T</i>	<i>B</i>	Relationship	Conclusion
Metacognitive Beliefs → Learning Styles → Academic Performance	3.175*	0.121	Positive	Approved

*: At the 0.05 level the effect is notable.

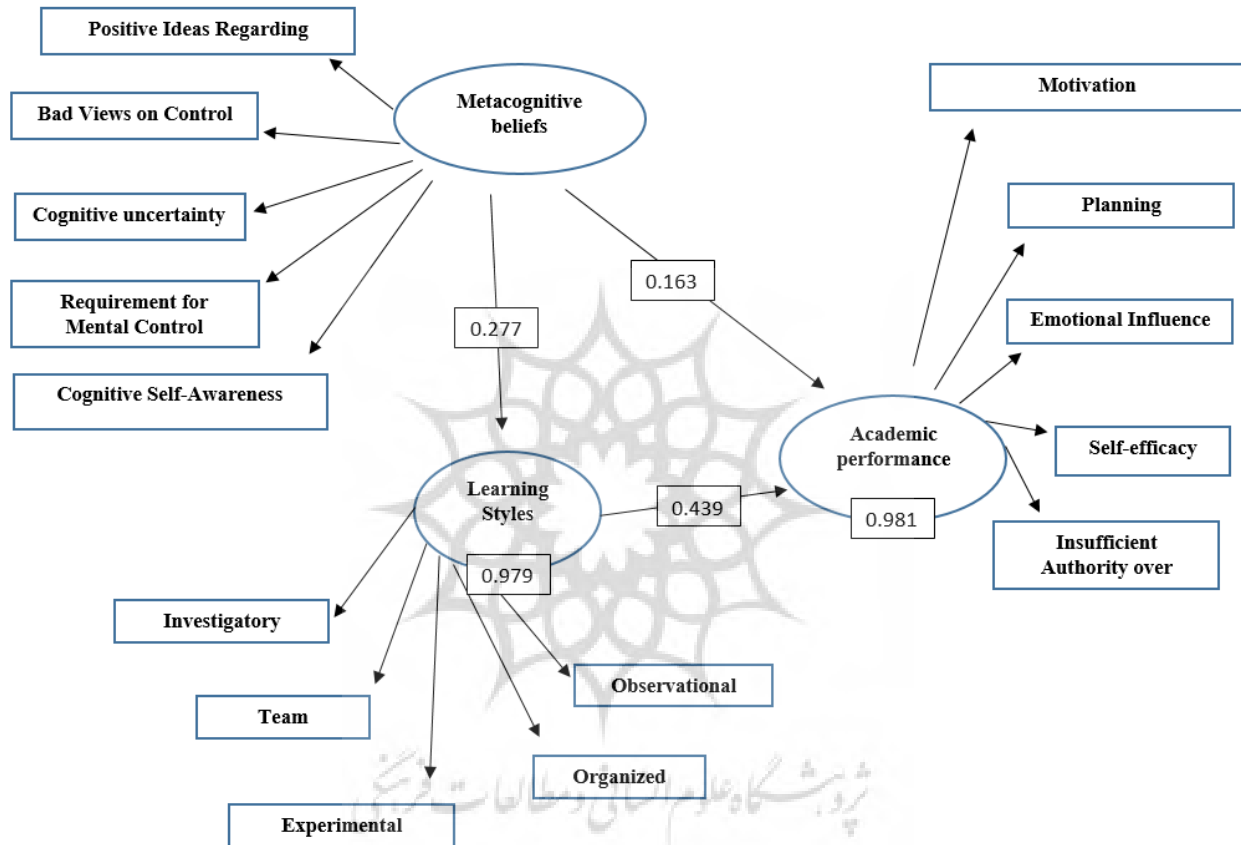


Diagram 3
Path coefficients among the model variables

The answers of the research at the 95% confidence level are clarified below considering the path coefficients and the absolute value of *t*: Learning styles can be argued to mediate the link between metacognitive beliefs and academic performance since the absolute value of *t* in the inverse relationship between them (3.175) is more than the minimum significant

value of 1.96 (Table 4). The standardized coefficient β in the metacognitive beliefs table indicates that the mediation of learning styles indirectly explains around 12% of the variations in the academic performance variable.

We used Cohen's f^2 , the Stone-Geisser test, and the coefficient of determination (R^2)

of latent and dependent variables to assess the structural model.

Table 5

Model's Determination Coefficient for Dependent and Latent Variables

Variable	R^2
<i>Learning Styles</i>	0.979
<i>Academic Performance</i>	0.981

Table 5 indicates that the coefficient of determination values for the dependent variables are robust.

Table 6

Coefficient Values of Impact for Each Latent and Dependent Variable

Construct	f^2
Learning Styles	46.619
Academic Performance	51.632

Table 6 illustrates that the substantial influence of the independent variables on the dependent variables in the linkages between

the variables as indicated by high Cohen's coefficient values for them.

Table 7

Latent Variable Convergent Validity

Variable	Convergent Validity
Metacognitive Beliefs	0.881
Learning Styles	0.903
Academic Performance	0.899

Table 8

Model latent variable cross-valuation redundancy

Variable	Convergent Validity
Learning Styles	0.921
Academic Performance	0.92

It is noted from the preceding tables' values of *CV communality* and *CV redundancy* that the latent variables in the research have a decent predictive capacity.

As so, the structural model fits really well. Additionally, applied in evaluation of the general structural equation model was the GOF fit index.

Table 9
Structural model and general research model fit indices

Construct	Communality	R^2
Metacognitive Beliefs	0.881	----
Learning Styles	0.903	0.979
Academic Performance	0.899	0.981
Mean of Criteria	0.902	0.98
$GOF = \sqrt[2]{Communality \times R^2} = \sqrt[2]{0.884} = 0.940$		

The GOF value for the research model is 0.940, indicating a strong fit of the research model," the table above shows.

4. Discussion

With learning styles acting as a mediating variable, this study looked at how metacognitive beliefs related to academic performance among students. As shown, variables of metacognitive beliefs and academic performance had a favorable and noteworthy link. Considering the negative scoring of the dimensions of negative beliefs about control, cognitive uncertainty, and the need for thought control, it can be concluded that while increasing positive beliefs about worry and cognitive self-awareness leads to an increase in academic performance, increasing negative beliefs about control, cognitive uncertainty, and the need for thought control leads to a decrease in academic performance. Furthermore, among the aspects of metacognitive beliefs, negative attitudes about control had the largest link with academic performance whereas the requirement of mind control had the lowest. Furthermore taken into account in view of the sign of the correlation coefficients between dimensions of learning styles and academic performance is the positive and substantial

link between them. Consequently, it can be said that academic performance rises in every dimension of learning styles. Moreover, among the several aspects of learning styles, the group style showed the lowest link with academic success and the experienced style showed the strongest.

The results of this hypothesis align with the findings of studies by Alizadeh and Yahek (2022), Ostewar (2022), Taherzadeh Ghafarakhhi et al. (2022), Mousavi (2022), Ghafarzadeh et al. (2022), Najafipour et al. (2021), Ali-Askarnjar et al. (2022), Armandeh et al. (2021), Masoumi et al. (2021), Ghadampour et al. (2019), Dehghani and Hektianfared (2019), Hashmipour et al. (2019), Yadalhifar and Mirzaei (2019), Silaj et al. (2021), Mahdavi et al. (2019), Jiang and Kleitman (2017), Ariastuti and Wahyudin (2022), Saleem et al. (2021), and Sabistin and Leung (2020).

It can be argued that a person's academic success influences their metacognitive beliefs—positive or negative—which helps to explain the acquired results. Should these views be negative, they negatively impact the academic performance of the pupil. When someone has favorable evaluation of their anxiety, they can even attempt to keep it

rather than try to manage it. Consequently, this anxiety itself causes anxiety and hence a poor performance. Someone who believes in danger and uncontrollability does not consider themselves as able of managing their anxious thoughts and concerns. They are quite sensitive to the degree of their concern and their incapacity to manage it; hence, too much worry causes the person to develop anxiety in a context like an exam. Weak cognitive confidence causes one to have little faith in their memory and themselves; this negative view lowers self-confidence and causes anxiety and stress in that regard. Strongly believing that they should be in charge of their ideas, someone feels compelled to be in charge of them and thinks they will be held responsible should they fail. This kind of thinking causes the person to have an improper sensitivity to managing their ideas; thus, the perspective that, should they be unable to control their thoughts, what implications it will have results in tension and anxiety in many spheres, including exam environments. Wells's model can also help one to understand these results. This paradigm holds that negative metacognitive beliefs guide one towards a negative assessment of anxieties and, hence, hyper-worry (Tahezadeh Ghafarakhi et al., 2022).

Given the general environment in schools and the kind of educational activities of teachers, this group of students shows better academic performance since students with a convergent learning style tend towards individual areas and projects, problem-solving, personal note-taking, and using educational materials provided by the teacher

(Kolb, 2005). The findings reveal that students like the chance to ponder and reflect during their education as well as to view objects from many angles and precisely in order to look for ideas and interpretations. They also want to be involved in class and throughout learning, experience or try with every idea and thinking oneself to enjoy their learning. They have a real and active interest in issues. The student has to be able to view events from several angles and consider them; they also have to be able to completely interact with them with their own desire and free from bias. They have to be able to develop ideas and combine their observations with appropriate logical frameworks (Masoumi et al., 2021).

In another perspective, it can be claimed that students have different academic issues during their studies, and this is while they may not have enough cognitive and learning methods to deal with them, which raises the possibility of avoidance and procrastinating activities in the individual. Stated differently, having metacognitive beliefs in students will boost their information processing; this will raise their academic performance and lower their procrastination and disengagement. Furthermore acknowledged are metacognitive methods, which enable people to choose, regulate, monitor, manage, and thereby enhance cognitive processes. Usually using metacognitive skills, students who participate more actively in their academic destiny guide their learning process, take responsibility for their learning. This group of students achieves more development in learning since metacognitive methods lead to

improved usage and direction of cognitive strategies (Sardari and Ahmadzadeh, 2019).

Among the limits of this research, we can mention the use of questionnaires, which may have biases and exaggerations in estimating characteristics or memory errors; also, the method of exams and the learning situation of students can also work in favor of a particular learning approach, so resulting in different academic performance. Another restriction of this research is that it is single-sex (female students) and conducted for female high school students in the city of Astaneh Ashrafieh, which implies that future studies should be conducted on male students and in other cities; it is suggested that teachers be familiar with learning styles and their strategies and consider the individual differences of students in this area. Teaching metacognitive ideas and learning strategies to parents, teachers, professors, and other educational and training participants will help to guide planning to raise the academic performance standards.

5. Conclusion

Higher the degree of metacognitive beliefs among students, one might say that they would be better equipped to plan, identify and introduce specific goals, and build tactics considering their significance in assessing, monitoring, or managing students's thinking and capacity. They can also be aware of their learning activities and how their work is evolving minute by minute as well as acknowledge their strengths and weaknesses. These pupils are less anxious about the test and its outcomes as they also expect a fair and exact performance from themselves. They

also control their ideas and keep an eye on and evaluate their skills, which allows them to be less anxious about their tests. Students who believe in the relative and complex character of knowledge, the acquired nature of learning ability, and the gradual character of the learning process feel more competent and efficient in learning and use higher-level metacognitive beliefs such cognitive self-regulation, so improving their academic performance. While negative beliefs can cause stress, anxiety, and worry about cognitive abilities, so a person with negative beliefs will not be able to control their thoughts and will lag in completing their homework; positive metacognitive beliefs can help people's perspective on their abilities to be in a positive direction (Alizadeh & Yahek, 2022). Supportive events include the impact of parents, mentors, past students, even academic activities might affect the development of learning techniques. One may therefore contend that learning and either improves or reduces academic performance depending on environmental limits and limitations, learning opportunities, and metacognitive beliefs.

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Conflicts of Interest

The Authors declare that there is no conflict of interest with any organization. Also, this research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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