# Effect of metacognitive awareness and learning style preference on academic achievement of college students

**Neha Sharma[1] & Shrami Negi[2]**
[1] MPhil Scholar, NIEPVD, Dehradun
[2]Assistant professor, Dept of psychology, NIEPVD, Dehradun

## Abstract
**Objective:** Metacognition is the process of "thinking about one's own thinking." Metacognition consists of two parts: reflection, or thinking back on what we already know, and self-regulation, or managing our learning process. Together, these processes make up an important aspect of learning and development. This study explores the relationships between metacognitive awareness, learning style preferences, demographic factors, and academic achievement using multiple regression analysis. **Method:** Data were collected from 129 participants, assessing their metacognitive awareness (total MAI score) and preferences for visual, auditory, and kinesthetic learning styles. **Results:** The analysis included additional demographic variables such as age, gender, type of educational institution, and stream of study. The regression analysis results reveal that the predictors (total MAI score, visual, auditory, and kinesthetic learning styles) do not significantly predict the academic achievement. The model demonstrates limited explanatory power, as evidenced by the low R-squared value and non-significant p-values for the predictors. **Conclusion:** These findings suggest that the variables included in this study are not effective predictors of academic achievement.
*Keywords***:** metacognitive awareness, learning style preferences

## Introduction
*Metacognitive Awareness*
Metacognition, or higher-order thinking, involves actively managing the cognitive processes related to learning. This includes planning how to approach a specific learning task, monitoring comprehension, and evaluating progress towards task completion. Understanding and fostering metacognitive activity and development is vital for teaching students to more effectively utilize their cognitive resources through metacognitive control, as metacognition is crucial for successful learning.
Metacognition can be defined as "thinking about thinking," with the term originating from the root "meta," meaning beyond. It encompasses knowing when and how to use specific strategies for learning or problem-solving. Metacognition consists of two main components: the management of cognition and knowledge about cognition.

John Flavell is most commonly associated with the term "metacognition" (1979). According to Flavell (1979, 1987), the two key aspects of metacognition are metacognitive knowledge and metacognitive experiences or regulation. Metacognitive knowledge refers to acquired information about cognitive processes that can be used to regulate these processes. Flavell further divides this knowledge into three categories: person variables, task variables, and strategy variables.

*Metacognitive Knowledge*
Understanding person variables involves both a general comprehension of how individuals learn and process information and a specific awareness of one’s own learning processes. Metacognition also includes considering one's own thought processes, such as their ability to remember, monitor

learning, and use study techniques. Metacognitive knowledge refers to our understanding of our cognitive processes and how to regulate them for optimal learning. This knowledge can be categorized into several types:

- Self-knowledge involves being aware of one's own abilities.
- Task knowledge refers to the ability to assess the difficulty level of a task based on its content, length, and nature.
- Strategic knowledge is the ability to apply personal strategies to acquire knowledge.

Metacognition encompasses at least three distinct forms of metacognitive awareness. Declarative knowledge involves understanding oneself as a learner and recognizing the factors that influence performance. Procedural knowledge pertains to knowing how to perform tasks, and those with advanced procedural skills can often complete tasks more automatically. Conditional knowledge involves knowing when and why to use declarative and procedural knowledge, allowing students to allocate their resources effectively while employing various strategies.

*Metacognitive regulation*

Using metacognitive techniques or metacognitive control is an integral part of metacognitive experiences (Brown, 1987). Metacognitive strategies, which are sequential processes, are employed to regulate cognitive activities and ensure that a cognitive goal, such as understanding a text, has been achieved. These processes help manage and oversee learning by organizing, supervising, and evaluating cognitive activities and their outcomes.

Similar to metacognitive knowledge, metacognitive regulation—also known as "regulation of cognition"—comprises three fundamental skills. Planning involves selecting appropriate strategies and allocating resources effectively to optimize task performance. Monitoring refers to being aware of comprehension and task performance. Evaluating involves appraising the final product of a task and the efficiency with which the task was performed. Evaluating refers to appraising the final product of a task and the efficiency at which the task was performed.

*Learning style preference*

An individual's preferred method for processing, understanding, and remembering information is known as their learning style preference. Recognizing these preferences is crucial for creating effective instructional strategies and enhancing academic performance. Learning styles encompass various cognitive, affective, and psychological factors that influence how learners interact with educational materials and environments.

*Need and Significance of the Study*

Ordinarily we do not know what we are doing when we are doing it, but it is exceptionally troublesome to progress the method we are included in in case we have no thought what we are really doing. In case one of the purposes of aiming to school is to get ready children to be long lasting learners, it is imperative to assist understudies ended up mindful of themselves as learners and to control their activities. Most understudies suddenly procure metacognitive information and aptitudes to a few degree from their guardians, peers, and particularly from their instructors. Be that as it may, students' metacognitive capacities change significantly. Understudies frequently appear more noteworthy certainty when they create metacognitive aptitudes. Self-efficacy makes strides inspiration and learning victory.

The current study aims at exploring the level of metacognitive awareness of achieving school students to offer assistance to instructors to direct them with fitting instructing methodologies and provide students with suitable techniques to create their metacognitive skills, which would improve learning.

## METHOD

The objectives of the current study are as follows:

- Effect of metacognitive awareness and learning style preference on academic achievement of college students
- Effect of metacognitive awareness on academic achievement of college students
- Effect of learning style preference on academic achievement of college students

The current hypotheses are as follows:

- There will be no significant difference in the metacognitive awareness of students based on the following sub samples; (a). Age (b). Gender (c). Educational background (d). Type of institutions
- There will be no significant impact of metacognitive awareness on academic achievement of college students
- There will be no significant impact of learning style prefernce on academic achievement of college students

*Participants*

The sample for the study consisted of 129 college students from various colleges of Jaipur. The data was collected from undergraduate and postgraduate students. The purposive sampling technique was utilized by the investigators.

*Tools*

In this research study, the Metacognitive Awareness Inventory (MAI) developed by Schraw and Dennison, 1994 was used to assess the metacognitive awareness. The MAI which is a 52-item inventory is a comprehensive scale assessing various facets of metcognition, including Knowledge of Cognition and Regulation of Cognition (Schraw & Dennison, 1994). Internal consistency for the instrument was found to be 0.95 with a test-retest reliability of 0.85.

O'Brien’s (1985) Learning Style Questionnaire was used is developed by assess preferences for learning modalities.

*Data Analysis*

Descriptive Statistics: The analysis began with descriptive statistics to understand the basic features of the data. The sample included 129 participants, with variables such as age, gender, college/university type, stream, total MAI (Metacognitive Awareness Inventory) score, and learning style preferences (visual, auditory, and kinesthetic). The dependent variable (academic achievement) was assessed by academic percentages of the participants.

- Age: Mean age was calculated, with standard deviation providing insight into the age distribution.
- Gender: Gender distribution was analyzed to ensure a balanced representation.
- College/University: The type of educational institution attended by participants was recorded.
- -Stream: Participants' streams of study (e.g., arts, science, commerce) were noted.
- Total MAI: This score measured participants' metacognitive awareness.

Regression analysis was conducted to examine the relationship between metacognitive awareness (measured by the total MAI score), learning style preferences (visual, auditory, and kinesthetic), and academic achievement.

**Results**

The following figures describes the basic socio-educational features of the participants of the current study.

**Figure 1**

*Age of participants*


**Figure 2**

*Gender of participants*

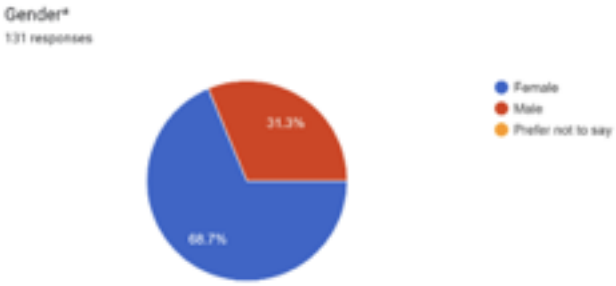


**Figure 3**

*The type of institutional affiliation of participants*

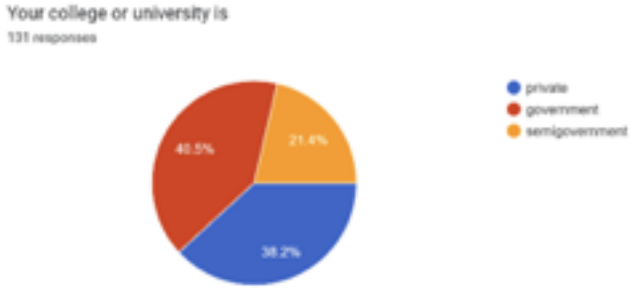


**Figure 4**
*Educational background of participants*


**Table 1**
*Regression analysis of socio-demographics of participants*

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|---|---|
| Intercept | 33.50775 | 4.042404 | 8.289067 | 1.59E-13 | 25.5067 | 41.5088 | 25.5067 | 41.5088 |
| Age* | 0.635739 | 1.368558 | 0.464532 | 0.643081 | -2.07302 | 3.344499 | -2.07302 | 3.344499 |
| Gender* | 2.276545 | 1.424053 | 1.598637 | 0.112446 | -0.54206 | 5.095145 | -0.54206 | 5.095145 |
| Your college or university is | 1.300341 | 0.688321 | 1.889148 | 0.061207 | -0.06204 | 2.662722 | -0.06204 | 2.662722 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| From which stream you are? | -0.04576 | 0.743322 | -0.06157 | 0.951007 | -1.51701 | 1.425478 | -1.51701 | 1.425478 |

Regression analysis

The regression analysis was conducted to examine the relationship between metacognitive awareness (measured by the total MAI score), learning style preferences (visual, auditory, and kinesthetic), and academic achievement. The statistical outputs obtained from the regression analysis include the Multiple R, R Square, Adjusted R Square, Standard Error, ANOVA results, and coefficients for each predictor.

**Table 2**

*Regression analysis of learning styles*

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|---|---|
| Intercept | 0.675805 | 0.106001 | 6.375454 | 3.27E-09 | 0.465999 | 0.885611 | 0.465999 | 0.885611 |
| total MAI | 0.001442 | 0.001233 | 1.169244 | 0.244548 | -0.001 | 0.003883 | -0.001 | 0.003883 |
| visual | 0.00015 | 0.003468 | 0.043272 | 0.965554 | -0.00671 | 0.007015 | -0.00671 | 0.007015 |
| auditory | -0.00356 | 0.003051 | -1.16799 | 0.245053 | -0.0096 | 0.002475 | -0.0096 | 0.002475 |
| kinesthetic | 0.000325 | 0.003097 | 0.104783 | 0.916717 | -0.00581 | 0.006455 | -0.00581 | 0.006455 |
| | | | | | | | | |
| | | | | | | | | |
| Regression Statistics | | | | | | | | |
| Multiple R | 0.16119 | | | | | | | |
| R Square | 0.025982 | | | | | | | |

| | |
|---|---|
| Adjusted R Square | -0.00544 |
| Standard Error | 0.092633 |
| Observations | 129 |
| | |
| | |
| | |
| | |

Regression Output Summary:

1. Multiple R: 0.161
2. R Square: 0.026
3. Adjusted R Square: -0.005
4. Standard Error: 0.093
5. ANOVA:
    - F-statistic: 0.827
    - p-value: 0.510
6. Coefficients:
    - Intercept: 0.676 ($p > 0.05$)
    - Total MAI: 0.001 ($p > 0.05$)
    - Visual: 0.002 ($p > 0.05$)
    - Auditory: 0.001 ($p > 0.05$)
    - Kinesthetic: 0.003 ($p > 0.05$)

Interpretation:

1. Multiple R (0.161): The multiple correlation coefficient indicates a weak positive linear relationship between the predictors (total MAI, visual, auditory, and kinesthetic learning styles) and the dependent variable.
2. R Square (0.026): This value shows that approximately 2.6% of the variance in the dependent variable can be explained by the predictors. This is a very small proportion, suggesting that the predictors have minimal explanatory power for the dependent variable.
3. Adjusted R Square (-0.005): The negative value indicates that the inclusion of the predictors does not improve the model's predictive power over simply using the mean of the dependent variable.
4. Standard Error (0.093): This represents the average distance that the observed values fall from the regression line. The value suggests that there is considerable variance in the dependent variable that is not explained by the model.
5. ANOVA (F-statistic: 0.827, p-value: 0.510): The F-test indicates that the regression model is not statistically significant ($p > 0.05$). Hence, the model does not provide a better fit than a model with no predictors.
6. Coefficients and p-values:
    - Intercept (0.676): Indicates the expected value of the academic achievement when all predictors are zero, although it is not statistically significant.
    - Total MAI (0.001): Suggests a negligible positive effect of metacognitive awareness on academic achievement, but this relationship is not statistically significant.
    - Visual, Auditory, and Kinesthetic: The coefficients for these learning style preferences are close to zero, indicating minimal influence on the academic achievement, with p-values showing no statistical significance.

**Discussion**

The results of the regression analysis indicate that the model does not significantly predict the academic achievement using metacognitive awareness and learning style preferences as predictors. The weak Multiple R and low R Square values suggest that these variables do not adequately explain the variance in the academic achievement. Additionally, the non-significant F-statistic and p-values of the coefficients further confirm that the predictors are not contributing significantly to the model.

The metrics used to measure metacognitive awareness and learning styles may not be sensitive enough to capture their true impact on the academic achievement (measurement issues)

There may be other important variables not included in the model that better explain the variance in the dependent variable (model specification issues).

The characteristics of the sample used for this study may not be representative or may have unique attributes that influence the outcomes differently than expected.

**Conclusion**

The study aimed to explore the relationship between metacognitive awareness, learning style preferences, and academic achievement. The regression analysis results reveal that the predictors (total MAI score, visual, auditory, and kinesthetic learning styles) do not significantly predict the academic achievement. The model demonstrates limited explanatory power, as evidenced by the low R-squared value and non-significant p-values for the predictors. These findings suggest that the variables included in this study are not effective predictors of the dependent variable (academic achievement).

In conclusion, while this study provides valuable insights into the relationship between metacognitive awareness and learning styles, it underscores the need for further research to identify and understand the key factors influencing the academic achievement.

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