



# The Relationship Between Body Mass Index and Concentration Levels in Nutrition Students: A Transversal Correlation Study

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## ABSTRACT:

**Background:** Nutritional status is a crucial factor influencing students' cognitive abilities and comprehension during the learning process. Concentration is a crucial mental aspect for mastering course material, but it is easily disrupted by internal and external factors, including inadequate nutrition, such as skipping breakfast. Initial observations of students in the Nutrition Study Program at Faculty of Sport and Health Sciences, Universitas Negeri Makasar (UNM) revealed a diversity of nutritional statuses and complaints of difficulty focusing (easily feeling sleepy) during lectures if they skip breakfast.

**Aims:** This study aims to analyze and prove the relationship between nutritional status and concentration levels in students of the Nutrition Study Program Faculty of Sport and Health Sciences, Makassar State University (UNM).

**Methods:** The type of research used is quantitative with a descriptive correlation design using a Cross Sectional approach. The study population was students of the Nutrition Study Program aged 18-22 years, with a total of 66 respondents selected through a purposive sampling technique. Measurement of nutritional status was carried out through anthropometric measurements (weight and height) which were converted into Body Mass Index (BMI). The concentration level was measured using the Test Grid Concentration. Data were analyzed using descriptive tests, normality tests, and Pearson correlation tests with the SPSS 23 program.

**Result:** The results of the descriptive analysis showed that most respondents had Normal nutritional status (41 of 66 respondents) and were in the Good concentration category (33 of 66 respondents). The results of the Pearson correlation test between nutritional status and concentration level produced a statistical value of  $P = 0.532$ .

**Conclusion:** Based on the statistical analysis, it was concluded that there was no significant relationship between nutritional status and concentration levels of students in the Nutrition Study Program at FIKK UNM ( $p = 0.532$ ). This result indicates that in the study population, nutritional status was not the primary factor influencing learning concentration, but rather was influenced by other factors such as breakfast habits and physical condition.

**Keywords:** Nutritional Status, Concentration

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## INTRODUCTION

Concentration is a fundamental ability defined as focusing attention on one particular object or thing for a relatively long time(Alshamsi et al., 2025; S. Li et al., 2025; Long et al., 2025). This ability is crucial and needed in the entire learning process at the higher education level(Duan et al., 2025; Lee et al., 2025; Ochoa et al., 2025). Without an optimal level of concentration, students will have difficulty mastering the knowledge and insights that are mandatory requirements in teaching and learning activities(Duplessis et al., 2025; Karatairis et al., 2025; F. Li et al., 2025; Lim & van Dam, 2025). Therefore, measuring and understanding the factors that influence students' learning concentration is urgent to ensure the achievement of maximum academic results (Conrad et al., 2025; Samland et al., 2024; Wang et al., 2024).

**Gap between Ideal Practice and Real Conditions** Ideally, students with good nutritional status tend to be more receptive to lessons and achieve maximum learning outcomes (Dudley et al., 2025; Hau & Lange, 2024; Ikonen et al., 2025), while insufficient or excessive nutritional status can cause less than optimal absorption of nutrients(Kimchy et al., 2025; Rudzińska et al., 2025; Sun et al., 2023). However, in practice, concentration in learning is often disturbed by various internal factors, including health conditions and inadequate nutritional intake(Economos et al., 2025; Olsson Haave et al., 2024; Rowley et al., 2025). Initial observations of students in the Nutrition Study Program at FIKK UNM in the 2021 cohort found common complaints such as drowsiness and difficulty understanding lecture material when they skipped breakfast (Choosong et al., 2025; Zhang et al., 2025). This condition indicates a gap between the ideal demand for a physically fit person to study and the actual conditions of student habits.

**The Opportunity for This Research** Interestingly, the population focused on in this study were Nutrition Study Program students, who are prospective nutritionists. As individuals studying health and nutrition, they are required to master competencies and understand the importance of nutritional balance. However, it was found that the habit of skipping breakfast, which is vital for daily nutritional intake, is still common among the class of 2021, and they have diverse nutritional statuses as seen from differences in body size. This contradiction creates a unique opportunity to empirically examine how far their personal nutritional status, which should be a primary concern, is actually related to their cognitive readiness, namely their level of concentration.

Despite extensive evidence suggesting a close link between nutritional status and cognitive performance, learning, and concentration, findings from previous studies remain inconsistent. Some studies report a positive association between normal nutritional status and improved concentration. Others indicate no significant relationship, instead emphasizing short-term behavioral factors, such as breakfast habits, sleep quality, and physical condition, as stronger determinants of attention. These inconsistent findings reveal an empirical gap regarding whether chronic nutritional indicators, particularly body mass index (BMI), are sufficient predictors of learning concentration in young adults. Furthermore, most prior studies have focused on general student populations, paying limited attention to students with formal nutrition knowledge. The present study addresses this gap by uniquely examining nutrition students individuals theoretically expected to maintain optimal nutritional awareness to test whether BMI-based nutritional status relates independently to concentration levels. By demonstrating a non-significant association between BMI and concentration in this population, the study provides novel evidence that challenges the conventional assumption that BMI is a primary cognitive determinant. This evidence highlights the need to reconsider immediate behavioral and contextual factors in academic concentration research.



Reasons for Choosing Variable X (Nutritional Status) The selection of nutritional status as an independent variable is based on its fundamental role as a measure of body condition that is influenced by the intake and use of nutrients in metabolism. Adequate nutritional status is very necessary for physical, mental, and emotional growth, as well as maintaining optimal body function. Especially in the cognitive context, adequate nutritional status is one of the important factors that theoretically affect a person's ability to concentrate. Nutritional balance, supplied through regular meals, plays a vital role in ensuring the body obtains energy such as glucose which is the main source of brain energy to support daily activities and maintain learning focus,

Research Objectives and Contributions Based on the background and urgency above, this study officially aims to determine the relationship between nutritional status and the concentration level of Nutrition Study Program Students of FIKK UNM. The contribution of this study is expected to provide practical benefits, namely: first, for students, this study can be an awareness to manage nutritional status in order to achieve better concentration; second, for educational institutions, these results can be used as evaluation material to improve the quality of lectures; and third, for further researchers, these findings can be a reference, guideline, or consideration for conducting further research related to nutritional status and concentration.

## METHOD

### Research Design

This research uses a quantitative research design with a descriptive correlation (or observational analytic) approach (Riyanto & Hatmawan, 2020; Saro et al., 2023). The design applied is a Cross Sectional study, where all variables (Nutritional Status and Concentration Level) are measured at a certain time (one measurement) in the same population, to analyze the correlative relationship between the independent variable (Nutritional Status) and the dependent variable (Concentration Level).

### Participant

The participants or sample in this study were students of the Nutrition Study Program, Faculty of Sport and Health Sciences (FIKK), Makassar State University (UNM), Class of 2021. The total sample size was 66 respondents. Inclusion criteria included Nutrition students of FIKK UNM Class of 2021 who were willing to participate and aged between 18 and 22 years.

### Population and the methods of sampling

The target population was all students of the Nutrition Study Program, Faculty of Sport and Health Sciences, Makassar State University (FIKK UNM), graduating class of 2021. Sampling was conducted using a non-probability sampling technique with a purposive sampling method. The sampling criteria were based on specific characteristics (graduate class of 2021, aged 18-22 years, and willingness to participate) deemed relevant to the research objectives, resulting in a total of 66 respondents who met the criteria.

**Instrument:**

This study uses two types of instruments to measure two main variables:

Variables	Measuring Instruments	Measurement Method	Classification
<b>Nutritional Status (Variable X)</b>	Anthropometry (Height and Weight)	Calculating Body Mass Index (BMI)	BMI classification according to the Ministry of Health (Thin, Normal, Fat/Obese).
<b>Concentration Level (Variable Y)</b>	<b>Test Grid Concentration</b>	Respondents were asked to cross out paired numbers according to the instructions for 10 minutes.	Categories (Very Good, Good, Average, Poor) based on the scores obtained.

**Psychometric Properties (Validity and Reliability):** Specific information regarding the validity and reliability of the instruments used (such as the Grid Concentration Test) in this population is not explicitly presented in the sections provided, but the instruments chosen are standard measurement tools commonly used in psychology and health research.

**Procedures and Time Frame (Procedures and Time Frame)**

The research procedure involves two main stages which are carried out directly at the research location (FIKK UNM Campus):

1. Anthropometric Measurements: Height (TB) and weight (BB) measurements are carried out to obtain data which is then used to calculate BMI.
2. Concentration Test: Respondents are given instructions and a Concentration Grid Test sheet and asked to complete it within a specified time limit.

The implementation timeframe (relevant to data collection) was implemented in May 2023 at the FIKK UNM Campus.

**Analysis Plan**

The collected data was processed using the SPSS version 23 statistical program. The analysis plan includes: Univariate Analysis (Descriptive): To describe the characteristics of the data for each variable, namely the frequency distribution and percentage of Nutritional Status and Concentration Level. Normality Test: To determine whether the data is normally distributed or not, in order to choose the appropriate inferential statistical test. Bivariate Analysis (Inferential): To test the hypothesis of the relationship between two variables. If the data is normally distributed, the Pearson Correlation Test is used. The significance criterion used is the p value.  $\leq 0.05$ .

## RESULTS AND DISCUSSION

### Result

Descriptive Analysis: The descriptive analysis showed that the majority of respondents had normal nutritional status (41 out of 66 students; 62.1%), while the remaining participants were categorized as underweight (28.8%) and overweight/obese (9.1%). Regarding concentration levels, most students demonstrated good concentration (50.0%), followed by moderate concentration (42.4%), with only a small proportion classified as very good (3.0%) or poor (4.5%). A detailed distribution of nutritional status and concentration levels is presented in Table 1.

**Table 1:** Frequency Distribution of Nutritional Status and Concentration Levels (N=66)

Variables	Category	Frequency	Percentage (%)
Nutritional Status (BMI)	Thin	19	28.8%
	Normal	41	62.1%
	Fat/Obesity	6	9.1%
Concentration Level	Very good	2	3.0%
	Good	33	50.0%
	Currently	28	42.4%
	Not enough	3	4.5%

Bivariate Correlation Analysis: The relationship between nutritional status (BMI) and concentration level was examined using the Pearson correlation test, as presented in Table 2. The analysis yielded a correlation coefficient of  $r = 0.078$  with a significance value of  $p = 0.532$ , indicating no statistically significant relationship between the two variables.

**Table 2:** Results of the Correlation Test of Nutritional Status and Concentration Level

Variables	Correlation Coefficient (r)	Significance Value (p)	Information
Nutritional Status vs. Concentration	0.078	<b>0.532</b>	<b>No Significant Relationship</b>

The results of the statistical analysis showed a significance value (p) of 0.532. Because the p value was much greater than 0.05, it was concluded that there was no statistically significant relationship between nutritional status (BMI) and concentration levels in Nutrition Study Program Students at FIKK UNM.

## Discussion

The present study found no statistically significant relationship between nutritional status, as measured by body mass index (BMI), and students' concentration levels. This suggests that BMI alone may not adequately capture the mechanisms underlying cognitive readiness and attentional performance in higher education students. Theoretically, BMI primarily reflects long-term body mass relative to height; it does not account for short-term metabolic processes that directly influence brain function, such as glucose availability, micronutrient status, or neural efficiency(Nuttall, 2015; Pikel et al., 2023). Concentration, on the other hand, is a dynamic cognitive process highly sensitive to immediate physiological and psychological conditions rather than chronic anthropometric indicators(Dai & Hu, 2025; Myga et al., 2022).

The absence of a significant association in this study aligns with several international studies reporting similar findings. For instance, studies of university students have shown that BMI is a weak or non-significant predictor of attention and academic concentration. Cognitive performance is more strongly influenced by behavioral factors, such as breakfast consumption, sleep quality, and daily energy intake(Ashar et al., 2025; Cheng & Rebecca Yew, 2025; Shah et al., 2025). These findings support the argument that acute nutritional behaviors and lifestyle patterns directly affect attentional processes more than body mass status alone. In this context, while BMI may function as a general health indicator, it lacks sensitivity as a proxy for cognitive functioning.

Conversely, other studies have reported a positive relationship between nutritional status and cognitive performance, particularly in populations experiencing undernutrition or severe nutritional imbalance. Such discrepancies highlight the importance of population characteristics. In settings where nutritional deficiencies are prevalent, BMI may indeed correlate with cognitive outcomes. However, in relatively healthy university populations especially among nutrition students who possess baseline knowledge of dietary balance the range of BMI variation may not be sufficient to produce meaningful differences in concentration. This helps explain why the present findings differ from studies conducted in nutritionally vulnerable groups or among younger populations.

Importantly, the very weak correlation coefficient observed in this study further reinforces the limited explanatory power of BMI for concentration outcomes. From an effect size perspective, this indicates that even if a statistical relationship were present, its practical significance would remain minimal. Theoretical models of cognition emphasize that attention is regulated by complex interactions between neural activation, energy metabolism, motivation, and environmental demands. BMI does not directly represent these processes and therefore may be insufficient as a standalone indicator in cognitive or educational research.

The findings of this study also carry specific relevance given the study population. Nutrition students are expected to have higher awareness of dietary practices, which may buffer the potential cognitive effects of suboptimal body weight. This suggests that knowledge and behavioral regulation may mediate the relationship between physical nutritional status and cognitive performance, further weakening the direct association between BMI and concentration. As such, the present study contributes to the growing body of evidence questioning the use of BMI as a primary explanatory variable for cognitive outcomes in adult academic populations.

Overall, this study supports a more nuanced understanding of the relationship between nutrition and cognition, emphasizing that indicators reflecting immediate nutritional intake and lifestyle behaviors may be more theoretically and empirically relevant than static anthropometric measures. Future research should therefore move beyond BMI and incorporate more sensitive nutritional and physiological indicators to better explain variations in learning concentration.

## CONCLUSION

The main conclusion of this study is that there is no statistically significant relationship between Nutritional Status as measured by Body Mass Index (BMI) and Concentration Level in Nutrition Study Program Students of the Faculty of Sport and Health Sciences, Makassar State University (UNM). The results of the Pearson correlation test showed a significance value of  $p = 0.532$ , which means the null hypothesis (no relationship) is accepted. Although the majority of respondents have Normal nutritional status (62.1%) and Good concentration level (50.0%), variations in BMI do not consistently explain or predict variations in their concentration ability. This finding implies that in this student population, other factors such as acute nutritional intake habits (e.g., breakfast), sleep quality, or psychosocial variables have a more dominant role in determining the level of learning concentration than chronic nutritional status reflected by BMI.

## AUTHOR CONTRIBUTION STATEMENT

A.N.A. conceptualized and designed the study, conducted data collection, performed statistical analysis, and drafted the original manuscript. H. contributed to data interpretation, critically reviewed and revised the manuscript, and supervised the research process. R.K. provided methodological validation, ensured analytical rigor, and contributed to manuscript refinement and final approval.

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