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Effectiveness of the Free Nutritious Meal (MBG) Program on Nutritional Status, Learning Concentration, and Student Attendance in South Jakarta Elementary Schools

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Abstract
Background. Malnutrition remains a major global health challenge affecting millions of school-aged children. Adequate nutrition during childhood is essential for optimal physical growth, cognitive development, and learning achievement
Aims. This study aimed to evaluate the effectiveness of the Free Nutritious Meal (Makan Bergizi Gratis/MBG) Program on the nutritional status, concentration in learning, and attendance of public elementary school students in Kebayoran Lama District, South Jakarta. A quantitative descriptive case–control design was used, involving 200 students from two public elementary schools—100 MBG beneficiaries and 100 non-beneficiaries.
Methods. Data were collected using a validated questionnaire measuring students' perceptions of the MBG program, nutritional status, learning concentration, and attendance, complemented by BMI records and structured observations. Statistical analyses included Shapiro–Wilk, Mann–Whitney U, Chi–Square, MANOVA, and Odds Ratio tests. Results showed that the MBG program significantly improved students' perceptions of its impact and contributed to better nutritional status in the experimental group, although improvements in learning concentration were not statistically significant. Attendance remained higher among control students, suggesting the influence of external factors such as family or environmental conditions.
Conclusion. The MBG Scale demonstrated good validity and reliability (Cronbach's $\alpha = 0.65–0.73$). Overall, the MBG program positively influenced students' nutritional status and perceptions of program benefits, but had limited effects on cognitive and attendance outcomes.
Implementation. Strengthening program implementation quality, expanding coverage, and integrating psychological and family support components are recommended to enhance its effectiveness and sustainability.

Keywords: Program Makan Bergizi Gratis; Free Nutritious Meal Nutritional Status; Learning Concentration; Student Attendance; Key Population; Elementary School Students; South Jakarta

INTRODUCTION

Malnutrition remains a major global health challenge affecting millions of school-aged children.[1] Adequate nutrition during childhood is essential for optimal physical growth, cognitive development, and learning achievement.[2] Studies show that children with good nutritional status demonstrate higher concentration and school attendance compared with those who experience nutrient deficiencies.[3] Conversely, inadequate intake of protein, calories, iron, or micronutrients leads to fatigue, low attention span, and absenteeism.[4] School-based nutrition programs therefore play a critical role in supporting educational quality through balanced daily meals.[5]

Globally, around 148 million children under five suffer from stunting, 45 million from wasting, and 37 million are overweight—illustrating the coexistence of under- and over-nutrition known as the double burden of malnutrition.[6] The World Health Organization (WHO) has emphasized that stunting and wasting together contribute to nearly 45 % of child deaths worldwide.[7]

In Indonesia, nutritional problems remain a priority issue in human capital development. Data from the *Survei Status Gizi Indonesia* (SSGI) 2024 show a national stunting prevalence of 19.8 %, declining from 21.5 % in 2023 but still exceeding the WHO threshold of <20 % and the national target of 14 % by 2029.[8] The same survey recorded 16.8 % underweight, 7.4 % wasting, and 3.4 % overweight, confirming that Indonesia continues to face a multidimensional nutrition gap.[9] These conditions persist despite various national programs for improving food security and community health.[10]

Regional disparities further illustrate the challenge. West Java successfully reduced stunting to 15.9 % in 2024, while several eastern provinces, including Papua Pegunungan and West Sulawesi, still report rates above 30 %.[11] Such inequalities reflect uneven access to nutritious food, sanitation, and health education across regions. In response, the Indonesian government through the *Tim Percepatan Penurunan Stunting (TP2S)* and the National Nutrition Agency targets a reduction in national stunting rates to 18.8 % by 2025 and 14.2 % by 2029.[12]

To accelerate progress, the government launched the Free Nutritious Meal Program (*Makan Bergizi Gratis – MBG*) in January 2025, one of the largest nutrition interventions ever

implemented in Indonesia.[13] The program operates across 190 pilot sites in 26 provinces, providing meals to more than 19 million beneficiaries—including students, preschoolers, and pregnant or lactating women—through Nutrition Fulfillment Service Units (*Sentra Pemenuhan Pangan Gizi – SPPG*) managed in partnership with cooperatives and private sectors.[14] With a national allocation of approximately IDR 71 trillion, the MBG program embodies a cross-sectoral strategy to strengthen food security, reduce malnutrition, and enhance educational outcomes.[15]

At the local level, DKI Jakarta represents an urban paradox where economic prosperity coexists with nutritional inequality. The SSGI 2024 reported stunting prevalence of 17.2 %, underweight 14.9 %, wasting 7.4 %, and overweight 4.8 % among children.[16] Despite superior access to health and education services, many students from low-income families still attend school without adequate breakfast or daily nutrient intake, affecting concentration and attendance.[17] Consequently, the Jakarta Provincial Government implemented the MBG program in elementary schools to ensure equal access to nutritious food and improve learning readiness.[18]

However, empirical evaluation of the MBG program's effectiveness remains limited. Previous studies have focused mainly on national nutrition indicators or dietary intake, without integrating behavioral and educational outcomes such as concentration and attendance. [19] Assessing the real-world impact of MBG at the local level is essential to generate evidence for policy improvement and program sustainability.

Therefore, this study aims to analyze the effectiveness of the Free Nutritious Meal (MBG) Program on students' nutritional status, learning concentration, and attendance in public elementary schools in South Jakarta.

METHODS

This research employed a quantitative descriptive approach combined with a case–control design to analyze the effectiveness of the *Free Nutritious Meal (Makan Bergizi Gratis/MBG) Program* on students' nutritional status, concentration, and attendance. The study was conducted in May 2025 at two public elementary schools in South Jakarta, namely SDN Cipulir 03 Pagi and SDN Grogol Utara 13 Pagi, located in Kebayoran Lama District, South Jakarta, Indonesia. The research population comprised all students enrolled in Grades IV and

V at both schools. Sampling was carried out using a purposive sampling technique with inclusion criteria of children aged 8–12 years, having attended school for at least six months, and not presenting with severe medical conditions or special educational needs. A total of 200 respondents participated, divided equally into 100 students in the experimental group (beneficiaries of the MBG program) and 100 students in the control group (non-beneficiaries).

Data were collected using a Likert-scale questionnaire developed from several theoretical frameworks, including the Health Belief Model, Bandura's Social Learning Theory, Maslow's Hierarchy of Needs, Piaget's Cognitive Development Theory, Schunk's Information Processing Theory, Skinner's Behaviorist Theory, Self-Determination Theory, and Finn's Model of Student Participation. The instrument measured four main variables: students' perception of the MBG program, nutritional status, learning concentration, and school attendance. Learning concentration was assessed using an adapted version of the Attentional Control Scale for Children (ACS-C). Data collection was complemented by structured observations, open-ended interviews, and secondary data such as school attendance records. Statistical analysis included the Shapiro–Wilk normality test, followed by independent T-test for normally distributed data or Mann–Whitney U test for non-parametric data. Additional tests comprised Chi-Square, Multivariate Analysis of Variance (MANOVA), Odds Ratio analysis, and instrument validity and reliability testing for the MBG questionnaire. All analyses were performed using SPSS and Python software.

The study obtained ethical clearance from *Indonesian Bhakti Husada University, Kuningan, West Java* (Approval No. 109/EP/UBHI/VI/2025). Written informed consent was provided by parents or guardians of respondents on July 24th, 2025 (experimental group) and July 31st, 2025 (control group).

DISCUSSION

The univariate analysis showed that the experimental group, consisting of *Free Nutritious Meal (MBG)* beneficiaries, was slightly dominated by male students (51%), while the control group had a higher proportion of female students (54%). Most respondents in the MBG group were Grade 4 students (55%), whereas the control group was slightly dominated by Grade 5 students (51%). In terms of age, the majority of MBG participants were 11 years old (49%), while the control group was evenly distributed between 10- and 11-year-olds (38% each), indicating that both groups were relatively comparable in demographic composition.

The validity and reliability test results indicate that the *Free Nutritious Meal (MBG) Scale* possesses acceptable psychometric quality. All items across the four dimensions demonstrated correlation coefficients (*r*) greater than 0.30 and significance levels below 0.05, confirming that each item effectively measures the intended construct and thus can be considered valid.

Reliability analysis using Cronbach's Alpha produced values ranging from 0.65 to 0.73, indicating that the instrument achieved adequate to high internal consistency. Specifically, the *Impact of MBG Program* ($\alpha = 0.65$), *Nutritional Status* ($\alpha = 0.68$), and *Student Attendance* ($\alpha = 0.66$) dimensions were categorized as adequately reliable, while the *Learning Concentration* dimension ($\alpha = 0.73$) was considered reliable. These findings confirm that the MBG Scale is a dependable tool for assessing the program's perceived impact, nutritional outcomes, learning concentration, and attendance among elementary students.

Table 1 presents the results of the descriptive analysis, indicating that the mean scores for students' perceptions of the *Free Nutritious Meal (MBG)* program and their nutritional status were higher in the experimental group, while attendance was slightly higher in the control group. Students in the experimental group demonstrated a more positive perception of the MBG program compared to those in the control group. The mean perception score for the experimental group was 25.03 (SD = 3.11), whereas the control group obtained a lower mean of 20.45 (SD = 5.29). The score range for the experimental group was 17 to 30, while the control group exhibited a much wider range, from 0 to 28.

These findings indicate that the *Free Nutritious Meal (MBG)* program had a clear and measurable impact on students' perceptions in the experimental group. The minimum score of zero in the control group suggests that some students did not experience any positive effects from the program, as they were not exposed to it. Conversely, the higher and more evenly distributed scores in the experimental group—with lower standard deviation—reflect consistent positive experiences among participants.

In terms of nutritional status, the experimental group again recorded higher average scores, 18.72 (SD = 3.01), compared to 16.48 (SD = 4.67) in the control group. The score range for the experimental group was 12 to 25, while the control group included extreme values, ranging from 0 to 24. This suggests that the *Free Nutritious Meal (MBG)* program contributed to improved or maintained nutritional conditions among students. The higher mean scores and absence of extreme low values among MBG beneficiaries indicate better and more consistent

nutritional outcomes, supporting the hypothesis that the program directly benefits students' health.

Additionally, findings from open-ended interviews revealed that most students in the experimental group were aware of their body weight and height, as schools routinely conducted *Body Mass Index (BMI)* measurements. In contrast, most students in the control group reported not knowing their BMI, further reflecting the program's positive influence on nutritional awareness and monitoring practices.

Table 1. Effectiveness of the Free Nutritious Meal Program on Nutritional Status, Learning Concentration, and Student Attendance

Scale	Group	Mean	SD	Min	Max
Perceived Impact of the MBG Program	Experimental	25.03	3.11	17.0	30.0
	Control	20.45	5.29	0.0	28.0
Nutritional Status	Experimental	18.72	3.01	12.0	25.0
	Control	16.48	4.67	0.0	24.0
Learning Concentration	Experimental	18.47	3.32	10.0	25.0
	Control	18.25	5.03	0.0	25.0
Student Attendance	Experimental	16.44	3.14	9.0	24.0
	Control	18.69	4.79	0.0	25.0

Source : Primary Data 2025

Table 2. Descriptive Analysis of Body Mass Index (BMI) in the Control and Experimental Groups

Control	**SD**	**Mean**	**Median**	**Min**	**Max**
	3,64	18,40	17,90	11,11	34,02
	Category	**Cut-off WHO**		**(n)**	**(%)**
	Underweight	< 18,5		54	55,0
	Normal	18,5 – 24,9		38	39,0
	Overweight	25 – 29,9		6	6,0
	Obese	≥ 30		2	2,0
	Total	—		**100**	**100**
Experi-mental	**SD**	**Mean**	**Median**	**Min**	**Max**
	4,12	17,81	16,66	11,87	36,26
	Category	**Cut-off WHO**		**(n)**	**((%)**
	Severely Underweight	Z-score < -3 SD		40	40,0
	Underweight	-3 SD ≤ Z-score < -2 SD		30	30,0
	Normal	-2 SD ≤ Z-score ≤ +1 SD		24	24,0
	Overweight	+1 SD < Z-score ≤ +2 SD		3	3,0
	Obese	Z-score > +2 SD		3	3,0
	Total	—		100	100,0

Source : Primary Data 2025

Table 2 for the control group, the nutritional status distribution was as follows: underweight (55%), normal (39%), overweight (6%), and obese (2%). The mean BMI was

18.40 (median = 17.90; SD = 3.64; min = 11.11; max = 34.02). Both the mean and median values fall slightly below the normal BMI range (18.5–24.9), indicating that the control group tended toward an *underweight* status. This finding aligns with the distribution results, showing that more than half of the students experienced nutritional deficiencies. Thus, the control group represents the baseline condition of students without nutritional intervention, highlighting the necessity of the Free Nutritious Meal (MBG) program to address this issue.

In the experimental group, the mean BMI was 17.81 (median = 16.66; min = 11.87; max = 36.26), also below the normal threshold, suggesting a general tendency toward undernutrition. Based on WHO classification, 70% of students were categorized as *severely underweight* (40%) or *underweight* (30%), while only 24% had *normal nutrition* and 6% were *overweight or obese*. These results confirm that most students in the experimental group still experience nutritional deficits, which can affect growth, immunity, and cognitive development (WHO, 2007; UNICEF, 2019). The high prevalence of undernutrition provides a crucial baseline for evaluating the MBG program's effectiveness in improving nutritional status and reducing malnutrition rates among school-age children.

Table 3. Comparison and Distribution of Nutritional Status Based on Respondents' BMI Measurements

Variables	**Experimental**	**Control**
Mean	17,81	18,52
Median	16,66	17,65
Min BMI	11,87	13,10
Max BMI	36,26	31,24
Dev. Standard	4,12	3,84
Nutritional Status	**Experimental (n/%)**	**Control (n/%)**
Severely Underweight	40 (40,0%)	32 (32,0%)
Underweight	30 (30,0%)	28 (28,0%)
Normal	24 (24,0%)	30 (30,0%)
Overweight	3 (3,0%)	5 (5,0%)
Obese	3 (3,0%)	5 (5,0%)
Total	**100 (100%)**	**100 (100%)**

Source : Primary Data 2025

The descriptive analysis presented in Table 3 demonstrates that the experimental group exhibited a lower mean Body Mass Index (BMI) (M = 17.81) compared to the control group (M = 18.52), suggesting that students within the intervention group generally possessed poorer nutritional status prior to the implementation of the *Free Nutritious Meal (MBG) Program*. The

prevalence of undernutrition was notably higher among the experimental group (70%) relative to the control group (60%), whereas the proportion of students with normal nutritional status was higher in the control group (30%). These findings substantiate the appropriateness of the experimental group as the primary target for nutritional intervention and establish a baseline for evaluating subsequent program impact.

In terms of cognitive performance, the experimental group demonstrated a slightly higher mean score for learning concentration (M = 18.47, SD = 3.32) compared with the control group (M = 18.25, SD = 5.03). The smaller standard deviation in the experimental group reflects greater consistency in cognitive engagement among students exposed to the MBG program. However, attendance rates were higher among the control group (M = 18.69, SD = 4.79) than the experimental group (M = 16.44, SD = 3.14). This discrepancy suggests that while nutritional intervention may enhance concentration and cognitive readiness, attendance is influenced by additional factors such as program logistics, menu variability, and extraneous social or familial conditions. These findings warrant further multivariate analysis to disentangle the indirect pathways linking nutrition intervention to school participation outcomes.

The analytical results are summarized in Table 4 below. Normality testing using the Shapiro–Wilk test at a significance level of $\alpha = 0.05$ revealed that all variables in the control group were not normally distributed. Consequently, the non-parametric Mann–Whitney U test was applied to examine group differences. As presented in Table 5, the results indicated significant differences in students' *perceptions of the MBG program's impact* and *nutritional status* ($p < 0.05$), with higher mean scores observed in the experimental group compared to the control group. These findings suggest that the *Free Nutritious Meal (MBG) Program* effectively improved students' perceived program impact and nutritional outcomes. However, *learning concentration* did not differ significantly between groups ($p > 0.05$), implying that the program's effect on students' cognitive focus was not yet optimal. In contrast, *student attendance* differed significantly between groups, but with higher mean values in the control group, reinforcing the Chi-Square results indicating that the MBG program has not yet produced a positive impact on attendance.

The Chi-Square test results further revealed that, within the experimental group, both *perception of the program's impact* and *nutritional status* showed significant imbalances, with the majority of students exhibiting high perception levels and improved nutritional status. This finding supports the conclusion that the MBG program successfully enhanced positive

perceptions and nutritional quality among elementary students. Conversely, *learning concentration* in the experimental group was not significant, suggesting a relatively even distribution between high and low concentration levels—indicating the program's limited immediate effect on focus. For *attendance*, the significant but negatively skewed distribution demonstrated that most students still exhibited lower attendance levels, implying the influence of external factors beyond the program's scope.

In the control group, significant results were found for *perception, concentration,* and *attendance*, while *nutritional status* remained evenly distributed. This pattern suggests that in the absence of program intervention, students' perceptions and nutritional status did not vary substantially, though fluctuations in learning concentration and attendance persisted.

MANOVA results reinforced earlier findings, with a Wilks' Lambda of 0.5408, indicating that approximately 46% of the variance in group differences could be explained by the combined effect of the dependent variables. A significant multivariate difference was found between the experimental (MBG recipients) and control (non-recipients) groups ($p < 0.001$). The experimental group exhibited higher overall means in perception, nutritional status, and concentration, whereas

attendance was higher among control students. These differences suggest that while the MBG intervention improved certain outcomes, attendance may have been influenced by extraneous variables such as self-motivation, parental support, or transportation barriers.

Finally, Odds Ratio (OR) analysis revealed that 70% of students in the experimental group had high perceptions of the program's impact, compared to only 27% in the control group. The OR value of 0.16 (95% CI = 0.09–0.29; $p < 0.001$) indicates that the likelihood of having a high perception of program impact was significantly greater among experimental participants. Regarding nutritional status, 48% of the experimental group and 41% of the control group exhibited good nutritional status. The OR of 0.75 (95% CI = 0.43–1.32; $p = 0.39$) showed no significant difference between groups, although the experimental group displayed slightly better outcomes. Learning concentration was identical across groups (41%), with an OR of 1.00 (95% CI = 0.57–1.76; $p = 1.00$), confirming no significant difference. In contrast, student attendance was significantly higher in the control group (62%) than in the experimental group (22%), with an OR of 5.78 (95% CI = 3.11–10.78; $p < 0.001$), indicating that students in the control group were substantially more likely to demonstrate higher attendance rates.

Table 4 Analytical Comparison of Variables Between Experimental and Control Groups

Scale	Group	Shapiro–Wilk Statistic	Sig. (p)	Conclusion
Impact of the MBG Program	Experimental	0.951	0.001	Not Normal
Impact of the MBG Program	Control	0.803	< 0.0001	Not Normal
Nutritional Status	Experimental	0.975	0.058	Normal
Nutritional Status	Control	0.861	< 0.0001	Not Normal
Learning Concentration	Experimental	0.977	0.077	Normal
Learning Concentration	Control	0.847	< 0.0001	Not Normal
Student Attendance	Experimental	0.983	0.209	Normal
Student Attendance	Control	0.775	< 0.0001	Not Normal

Variable	U	p-value	Asymp. Sig. (2-tailed)	Mean (Experimental)
Impact of the MBG Program	8286.5	0.0000	< 0.0001	25.03
Nutritional Status	6703.0	0.0003	0.00034	18.72
Learning Concentration	4993.5	0.6236	0.624	18.47
Student Attendance	2808.0	0.0000	< 0.0001	16.44

Variable	Experimental (χ^2)	p-value	Control (χ^2)	p-value
Perception of MBG Program Impact	36.00	0.000	9.85	0.002
Nutritional Status	5.76	0.016	0.62	0.433
Learning Concentration	3.24	0.072	6.50	0.011
Student Attendance	7.84	0.005	18.62	0.000
Variable	**Experimental**	**Control**	**Multivariate Test**	**Value**
Impact of the MBG Program	25.03	20.57	Wilks' Lambda	0.5408
Nutritional Status	11.56	10.56	Pillai's Trace	0.4592
Learning Concentration	11.01	10.49	Hotelling's Trace	0.8492
Student Attendance	16.44	18.61	Roy's Greatest Root	0.8492
Variable	**High (%) Experimental**	**High (%) Control**	**Odds Ratio**	**95% CI**
Impact of MBG Program	70%	27%	0.16	0.09–0.29
Nutritional Status	48%	41%	0.75	0.43–1.32
Learning Concentration	41%	41%	1.00	0.57–1.76

Student Attendance	22% (22/100)	62% (62/100)	5.78	3.11–10.78

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Learning Concentration	41%	41%	1.00	0.57–1.76
Student Attendance	22% (22/100)	62% (62/100)	5.78	3.11–10.78

Source : Primary Data 2025

Table 5. Results of Validity, Reliability, Shapiro–Wilk, Independent T-Test, Mann–Whitney, Chi-Square, MANOVA, and Odds Ratio Analyses on the Learning Concentration Scale Among Recipients and Non-Recipients of the Free Nutritious Meal Program in South Jakarta

Type of Test	Statistical Result	p-Value	Interpretation
Item Validity	r = 0.159 – 0.530	p < 0.05	All items are valid
Reliability	Cronbach's Alpha = 0.635	–	Acceptable reliability
Normality (Shapiro–Wilk)	Experimental: W = 0.989; Control: W = 0.986	p = 0.596 (E), p = 0.377 (C)	Data are normally distributed
Independent T-Test	t = –2.78	p = 0.006	Significant difference in mean concentration
Mann–Whitney Test	U = 3939.5	p = 0.009	Difference remains significant (non-parametric)
Chi-Square Test	χ^2 = 2.02	p = 0.156	No significant association between high/low categories

MANOVA	Wilks' Lambda ≈ 0.97, F ≈ 3.02	p ≈ 0.051	Multivariate effect is marginally significant
Odds Ratio	OR = 0.64; 95% CI = [0.37–1.12]	–	Odds of high concentration in the experimental group are 0.64× that of the control group; not significant

Source : Primary Data 2025

Researcher also employed the standardized Attentional Control Scale for Children (ACS-C) to strengthen the measurement of the learning concentration variable among students, in addition to the combined scale previously developed and analyzed by the researcher.

Based on Table 5, the Learning Concentration Scale was found to be valid and reliable ($r = 0.159–0.530$, $\alpha = 0.635$). The normality test indicated that the data were normally distributed in both groups. The results of the Independent T-Test and Mann–Whitney Test showed a significant difference in mean learning concentration between the experimental and control groups ($p < 0.05$). This finding supports the conclusion that the Free Nutritious Meal Program effectively improves students' learning concentration.

However, the results of the Chi-Square and Odds Ratio analyses revealed that, when viewed categorically (High/Low), the proportion of students with high concentration did not differ significantly between groups ($p = 0.156$, OR = 0.64; 95% CI = 0.37–1.12). The MANOVA test, which included two sub-dimensions, also showed a marginally significant multivariate effect (Wilks' Lambda ≈ 0.97; $p \approx 0.051$).

Thus, the program can be considered effective in increasing the average score of learning concentration, even though the difference in categorical distribution has not yet reached a strong level. These analytical results further reinforce the robustness of the combined Free Nutritious Meal (MBG) Scale, in which learning concentration is one of the key variables.

DISCUSSION

Correlation Between the Free Nutritious Meal Program (MBG), Nutritional Status, Learning Concentration, and Student Attendance

Physiological factors, such as adequate nutrition, are essential for creating comfort and readiness in the learning process, as posited by Herzberg's Two-Factor Theory[35]. Similarly, Adams' Equity Theory[36] emphasizes that students' perceptions of fairness in accessing resources—such as free nutritious meals—can influence intrinsic motivation to attend and actively participate in school. The effectiveness of the MBG program can be conceptualized through causal pathways: by improving

students' nutritional status, the program indirectly enhances learning concentration, enabling students to process lessons more effectively and subsequently improving academic performance and school attendance. Furthermore, by preventing hunger and fatigue, MBG promotes motivation and active engagement, reflected in more consistent attendance. From a systems-based perspective, interventions targeting one component—here, nutrition—can produce systemic improvements in student behavior and academic outcomes. Students' perceptions of program benefits provide an important lens for evaluating effectiveness. Perception, as a cognitive construct, describes how individuals organize and interpret sensory information to understand their environment[37]. It is shaped by personal experience, motivation, values, and social context[38]. In the educational context, students who perceive a program as beneficial are more likely to engage actively, reinforcing the importance of positive perceptions in evaluating MBG outcomes.

Impact of the Free Nutritious Meal Program (MBG) on Nutritional Status, Learning Concentration, and Student Attendance

The MBG program aims to improve children's nutritional indices, including body mass index (BMI), hemoglobin levels, and the reduction of stunting and wasting prevalence. Positive shifts in nutritional status serve as early indicators of program effectiveness, with subsequent implications for learning outcomes. Empirical studies support the impact of school feeding programs. Grantham-McGregor et al.[39] reported that children receiving supplementary meals exhibited improved weight, nutritional status, and cognitive performance. Regular provision of nutritious meals reduces deficiencies in energy and key micronutrients—such as iron, iodine, and vitamin A—which are critical for physical and cognitive functioning. Enhanced nutritional status correlates positively with higher academic achievement and improved emotional wellbeing. Bundy et al.[40] emphasized that school feeding programs serve dual roles as social safety nets and educational interventions: "School feeding improves nutrition and cognition, and when linked with local agriculture, can generate community-wide benefits."

Concentration, a core component of learning, is strongly influenced by nutrition. Children with suboptimal nutritional status often exhibit reduced attention, memory retention, and learning motivation[41]. Kristjansson et al.[42], in a Cochrane systematic review, reported that school meal interventions positively affect cognitive functions, particularly attention and memory. Similarly, Grantham-McGregor, Chang, and Walker[43] found that children receiving a nutritious breakfast

demonstrated superior concentration and memory test performance compared to those who did not, with effects more pronounced among nutritionally at-risk populations.

According to Behavioral Intervention Theory, interventions are effective when they modify relevant environmental stimuli[44]. MBG acts as a positive stimulus, enhancing students' mental readiness, mood, and reducing hunger-induced distractions. This fulfills physiological needs, which supports cognitive functions essential for concentration and classroom engagement.

The MBG program also positively impacts attendance, particularly in low-income regions. Adequate morning nutrition ensures children have sufficient energy to attend and actively participate in school. From the perspective of social psychology, Adams' Equity Theory underscores the importance of perceived fairness; free meals are considered equalizers of educational opportunity. WHO[45] reported that improved nutrition reduces absenteeism by up to 20% in nutritionally vulnerable populations. WFP data[46] indicate school feeding can increase attendance by 15–20%, especially among girls and children from low- to middle-income households. Improved nutritional status and physical energy directly contribute to more stable attendance. Bundy et al.[40] found that daily nutritious meal interventions increased average attendance by 12–15%, especially among children from economically disadvantaged backgrounds. Similarly, INDEF[47] reported that school feeding programs enhanced educational access by reducing barriers to attendance, improving enrollment and participation, boosting concentration, and enhancing learning outcomes. Collectively, these findings highlight MBG's positive effect on both learning concentration and student attendance.

Researcher conducted structured classroom observations to assess the post-intervention effects of the Free Nutritious Meal (MBG) Program on students' behavior and learning concentration during the teaching and learning process. The observations were carried out in Grade IV and Grade V classrooms at one of the beneficiary schools of the program on June 3–4, 2025. Four psychological aspects were observed among the research participants: focused attention, attention span, self-regulation, and emotional stability.

Observation results indicated that among the 29 Grade IV students in the experimental group present during the observation, most were able to listen attentively to the teacher throughout the session without being distracted, remained seated without permission to leave, responded quickly and appropriately to questions, completed tasks independently, and displayed stable emotional control (no signs of irritability or frustration). Students were generally able to maintain attention for at least 15 minutes, stayed calm when encountering difficult problems, and showed minimal signs of fatigue (only

one or two students occasionally yawned). They also demonstrated strong self-restraint from engaging in off-topic conversations.

Among the 28 observed Grade V students in the same experimental group, similar behavioral patterns were recorded. Students consistently paid attention, completed tasks with little assistance, and maintained positive emotional stability—male students appeared cheerful and enthusiastic, while female students tended to be more serious and focused. Most were able to maintain concentration for at least 15 minutes, avoided distractions, and rarely showed signs of tiredness, though some exhibited mild fatigue after completing exercises or daily quizzes. A few male students occasionally stood up or chatted off-topic, whereas most female students remained seated and orderly.

Structured observations conducted later in July 2025 for the control group (60-minute sessions per class) revealed that Grade IV students were generally attentive and calm during lessons, able to sustain focus for over 15 minutes, respond accurately to teacher questions, and complete assignments independently. While some students occasionally turned their heads or engaged in minor off-task behaviors, they generally demonstrated adequate self-control and stable emotions. Similar patterns were found among Grade V control students, who mostly remained focused, attentive, and disciplined, with minimal signs of distraction or fatigue.

From these findings, both quantitative and observational data indicate that the Free Nutritious Meal (MBG) Program has a positive impact on improving students' nutritional status significantly, and on learning concentration to a moderate but not statistically significant extent. However, the program has not yet produced a tangible improvement in attendance among beneficiaries. The significant difference between the experimental and control groups suggests that the MBG intervention effectively supports students' physical conditions, which may, in turn, enhance their readiness to learn. Students' high perception of the program indicates strong psychosocial acceptance. Nonetheless, the absence of a significant difference in categorical concentration levels suggests that cognitive improvement may require complementary interventions—such as psychological reinforcement or a more supportive learning environment. Multivariate analysis (MANOVA) further demonstrated that the MBG Program simultaneously influenced the main dependent variables in this study. The Odds Ratio analysis also showed that students receiving the MBG Program had higher odds of achieving good nutritional status and regular attendance compared to non-recipients.

Further investigation is needed to understand underlying factors influencing attendance and learning consistency. Psychological and mental health factors—such as anxiety, depression, or family stress—can contribute to absenteeism[48]. Likewise, interpersonal relationships, including peer and

teacher support, influence students' sense of comfort and motivation to attend school[49]. Self-efficacy also plays a key role: students' belief in their own academic and social competence helps maintain consistent attendance and engagement[50].

In the context of primary education, nutrition plays a vital role. Nutritious food not only supports children's physical growth but also enhances attention, short-term memory, and engagement in classroom learning[51]. Thus, school-based nutrition programs are essential strategies to promote inclusive and high-quality education.

This study reaffirms that undernutrition remains prevalent in the control group. The proportion of underweight students—exceeding half of the total—demonstrates that nutritional problems among school-age children remain a serious concern. This aligns with WHO[52] and UNICEF[53] reports that undernutrition among school-aged children in developing countries, including Indonesia, is still high. The mean BMI of control group students approaching the lower limit of the normal range indicates vulnerability to malnutrition-related risks. This has implications for potential growth disorders, cognitive delays, and reduced academic performance[54]. Meanwhile, although the prevalence of overweight and obesity (around 8%) was relatively low, it still warrants attention given the global trend of increasing childhood obesity reported by Ng et al.[55].

As a control group in evaluating the MBG Program, these results are critical, as they represent the condition of students without nutritional intervention. Therefore, if the intervention group demonstrates improved nutritional status—either through increased BMI or reduced prevalence of underweight—then the program's effectiveness can be objectively validated. There is a strong interrelation between nutritional status, concentration, and school attendance. Good nutrition supports physical health and brain function, which enhances concentration. Optimal concentration enables students to engage more actively in learning, thereby improving attendance. Conversely, poor nutrition can underlie various learning problems such as low motivation, lack of focus, and high absenteeism.

In conclusion, the current nutritional data show an encouraging trend of improvement but also highlight ongoing challenges, particularly in ensuring equitable access and maximizing program effectiveness at the grassroots level. The long-term success of the Free Nutritious Meal Program depends on multi-sectoral collaboration, community participation, and continuous data-driven monitoring. When students' nutritional status improves, their learning concentration stabilizes, and attendance becomes more consistent—supporting the Human Capital Theory assumption that investment in children's health directly enhances the quality of human resources through education[56].

CONCLUSION

Based on the findings and discussions presented, it can be concluded that the Free Nutritious Meal (MBG) Program effectively improves students' perceptions of the program and their nutritional status, although it does not yield a statistically significant impact on learning concentration or school attendance. Nevertheless, the overall outcomes indicate a positive trend, particularly in enhancing students' perceptions, nutritional condition, and concentration stability within the experimental group compared to the control group. Conversely, the attendance indicator displayed an opposite pattern, suggesting the presence of external factors that may influence student participation, such as family conditions, transportation barriers, or school engagement practices. From a nutritional perspective, the experimental group showed lower BMI values and a higher prevalence of undernutrition than the control group, confirming that this population remains the most suitable target for continued nutritional interventions.

In light of these findings, it is recommended that program implementation be strengthened through the development of more comprehensive and reliable evaluation instruments. Further research should explore external determinants of attendance and the mediating relationship between nutritional status and learning concentration to identify causal pathways. Enhanced mentoring and continuous monitoring are essential to maximize cognitive and behavioral outcomes, while program expansion to other schools in South Jakarta is encouraged to ensure broader reach and sustainable improvement in students' learning readiness and academic achievement.

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Author Contributions

LW conceptualized and designed the study, developed the research framework, and supervised the overall implementation of the project. ENIP developed the theoretical model, drafted the manuscript, performed data analysis and computations, and verified the analytical methods applied. All authors participated in interpreting the results, critically reviewed the manuscript, and approved the final version for publication.

LW = Lely Wahyuniar; ENIP = Endahing Noor Iman Pustakasari.

Conflicts Of Interest

The authors declare no conflict of interest in this study.

REFERENCES

Adams JS. Toward an understanding of inequity. *J Abnorm Soc Psychol.* 1963;67(5):422–436.

Adams, J. S. (1963). Toward an understanding of inequity. *Journal of Abnormal and Social Psychology, 67*(5), 422–436.

Bureau; 2025.AP News. *Indonesia launches $71 trillion free nutritious meal program for children.* AP Jakarta

Bandura A. *Self-Efficacy: The Exercise of Control*. New York: W.H. Freeman; 1997.

Bandura, A. (1997). *Self-Efficacy: The Exercise of Control.* W.H. Freeman.

Becker GS. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. 3rd ed. Chicago: University of Chicago Press; 1993.

Becker, G. S. (1993). *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education* (3rd ed.). University of Chicago Press.

Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet.* 2020;382(9890):427–451.

Bronfenbrenner U. *The Ecology of Human Development: Experiments by Nature and Design*. Cambridge (MA): Harvard University Press; 1979.

Bundy D, Burbano C, Grosh M, Gelli A, Jukes M, Drake L. *Rethinking School Feeding: Social Safety Nets, Child Development, and the Education Sector*. Washington (DC): World Bank; 2009.

Bundy, D., et al. (2009). *Rethinking School Feeding: Social Safety Nets, Child Development, and the Education Sector.* World Bank.

Cohen J, Kristjansson E, Power M. School feeding and nutrition interventions for improving the health of children and adolescents in low- and middle-income countries. *Cochrane Database of Systematic Reviews.* 2022;11(2):CD009024.

Dinas Kesehatan Provinsi DKI Jakarta. *Profil Kesehatan DKI Jakarta Tahun 2024.* Jakarta: Dinkes DKI; 2024.

Dinas Kesehatan Provinsi Jawa Barat. *Laporan Kinerja Bidang Gizi Tahun 2024.* Bandung: Dinkes Jabar; 2024.

Florence MD, Asbridge M, Veugelers PJ. Diet quality and academic performance. *Journal of School Health.* 2008;78(4):209–215.

Goldstein, E. B. (2014). *Cognitive Psychology: Connecting Mind, Research, and Everyday Experience* (4th ed.). Cengage Learning.

Grantham-McGregor S, Cheung YB, Cueto S, Glewwe P, Richter L, Strupp B. Developmental potential in the first 5 years for children in developing countries. *Lancet.* 2007;369(9555):60–70.

Grantham-McGregor, S., Chang, S., & Walker, S. (1998). Evaluation of school feeding programs. *American Journal of Clinical Nutrition, 67*(4), 785–789.

Grantham-McGregor, S., et al. (2007). Developmental potential in the first 5 years for children in developing countries. *The Lancet, 369*(9555), 60–70.

Herzberg F. *The Motivation to Work*. New York: John Wiley & Sons; 1959.

Herzberg, F. (1959). *The Motivation to Work.* John Wiley & Sons.

Hoyland A, Dye L, Lawton CL. A systematic review of the effect of breakfast on the cognitive performance of children and adolescents. *Nutr Res Rev.* 2009;22(2):220–243.

Hoyland, A., Dye, L., & Lawton, C. L. (2009). A systematic review of the effect of breakfast on cognitive performance in children and adolescents. *Nutrition Research Reviews, 22*(2), 220–243.

Institute for Development of Economics and Finance (INDEF). (2024). *School Feeding Impact Report in Developing Countries.* Jakarta: INDEF Press.

Kementerian Kesehatan Republik Indonesia. *SSGI Dalam Angka 2024.* Jakarta: Pusdatin Kemenkes RI; 2024.

Kementerian Kesehatan Republik Indonesia. *Survei Status Gizi Indonesia (SSGI) 2024: Laporan Nasional*. Jakarta: Badan Kebijakan Pembangunan Kesehatan; 2024.

Kristjansson, E. A., et al. (2007). School feeding for improving the physical and psychosocial health of disadvantaged students. *Cochrane Database of Systematic Reviews,* CD004676.

Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults 1980–2013: A systematic analysis. *Lancet.* 2014;384(9945):766–781.

Ng, M., et al. (2014). Global, regional, and national prevalence of overweight and obesity. *The Lancet, 384*(9945), 766–781.

Pemerintah Provinsi DKI Jakarta. *Petunjuk Teknis Pelaksanaan Program Makan Bergizi Gratis Tahun 2024.* Jakarta: Dinas Pendidikan DKI Jakarta; 2024.

Pollitt E. Breakfast and cognition: An integrative summary. *American Journal of Clinical Nutrition.* 1993;67(4):804S–813S.

Pratiwi R, Wulandari D, Sari DN. Urban lifestyle, family income, and nutritional pattern among children in Jakarta. *Asia Pacific Journal of Clinical Nutrition.* 2023;32(2):88–97.

Prawiro SE, Widyastuti R, Hartati S. Determinants of child undernutrition in Indonesia: A systematic review. *BMC Public Health.* 2022;22(1):1342.

Rothman AJ, Salovey P. Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychol Bull.* 1997;121(1):3–19.

Rothman, A. J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior. *Psychological Bulletin, 121*(1), 3–19.

Santrock JW. *Educational Psychology*. 6th ed. New York: McGraw-Hill Education; 2019.

Santrock, J. W. (2019). *Educational Psychology* (6th ed.). McGraw-Hill Education.

Schiffman, L. G., & Wisenblit, J. (2015). *Consumer Behavior* (11th ed.). Pearson Education.

Stunting.go.id. *Laporan Implementasi Sentra Pemenuhan Pangan Gizi (SPPG) 2025.* Jakarta: Sekretariat TP2S; 2025.

Taras H. Nutrition and student performance at school. *Journal of School Health.* 2005;75(6):199–213.

Taras, H. (2005). Nutrition and student performance at school. *Journal of School Health, 75*(6), 199–213.

Tempo. *Program Makan Bergizi Gratis Diluncurkan di 190 Lokasi Pilot.* Jakarta: Tempo.co; 2025.

Tim Percepatan Penurunan Stunting (TP2S). *Rencana Aksi Nasional Percepatan Penurunan Stunting 2024–2029.* Jakarta: Sekretariat Wakil Presiden RI; 2024.

UNICEF. (2019). *The State of the World's Children 2019: Children, Food and Nutrition.* UNICEF.

UNICEF. *The State of the World's Children 2019: Children, Food and Nutrition*. New York: UNICEF; 2019.

UNICEF. *The State of the World's Children 2023: For Every Child, Nutrition.* New York: UNICEF; 2023.

Wentzel KR. Social relationships and motivation in middle school: The role of parents, teachers, and peers. *J Educ Psychol.* 1998;90(2):202–209.

Wentzel, K. R. (1998). Social relationships and motivation in middle school. *Journal of Educational Psychology, 90*(2), 202–209.

World Food Programme (WFP). *State of School Feeding Worldwide 2020*. Rome: WFP; 2020.

World Food Programme. (2020). *State of School Feeding Worldwide.* WFP.

World Health Organization (WHO). *Levels and Trends in Child Malnutrition: Key Findings of the 2023 Edition of the Joint Child Malnutrition Estimates.* Geneva: WHO; 2023.
World Health Organization (WHO). *Levels and Trends in Child Malnutrition: Key Findings of the 2020 Edition of the Joint Child Malnutrition Estimates*. Geneva: WHO; 2020.
World Health Organization. (2007). *WHO Child Growth Standards.* Geneva: WHO.
World Health Organization. (2008). *School Policy Framework: Implementation of the Global Strategy on Diet, Physical Activity and Health.* WHO.
World Health Organization. (2020). *Malnutrition: Key Facts.* Geneva: WHO.
World Health Organization. *Global Nutrition Targets 2025: Policy Brief Series.* Geneva: WHO; 2022.