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Teachers' Strategies to Address Picky Eating in Indonesian PAUD Classrooms: A Sequential Explanatory Mixed-Methods Study

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ABSTRACT

Picky eating is a common issue among preschool children, potentially impacting their nutritional status and development. This study aimed to examine teacher-led strategies in addressing picky eating behaviors among children aged 4–6 years in early childhood education (PAUD) settings in the Mawar Cluster, Moga District, Indonesia. A sequential explanatory mixed-methods design was employed. Quantitative data were collected from 36 identified picky eaters through anthropometric measurements (BAZ) at baseline and after a 12-month school-based supplementary feeding program (PMTAS). Additional data included responses from 14 teachers and 36 parents using the Children's Eating Behaviour Questionnaire (CEBQ). Qualitative data were gathered via interviews, classroom observations, and documentation, and analyzed thematically. The proportion of children with normal nutritional status increased from 86.1% to 91.6%, with improvements noted in undernutrition and overweight cases. Teachers employed strategies such as integrating nutrition education into thematic learning (e.g., songs, role-play), creative food presentation, communal eating routines, and close collaboration with parents. These efforts were reinforced at home through adapted lunchbox practices and consistent communication. The integration of pedagogical approaches with parental involvement effectively improved children's food acceptance and nutritional outcomes. The findings support the importance of structured, enjoyable, and collaborative strategies in addressing picky eating in PAUD settings. These results offer practical implications for teacher training and the enhancement of school-based nutrition interventions in early childhood education.

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1. INTRODUCTION

Early childhood represents a critical period for establishing lifelong health behaviors, including dietary habits. During the ages of four to six years, children experience rapid physical, cognitive, and socio-emotional development, all of which depend heavily on adequate and balanced nutritional intake

(Santrock, 2021). However, one of the most common challenges affecting children's nutrition during this developmental stage is picky eating behavior. Picky eating is generally characterized by the rejection of certain foods, limited dietary variety, and reluctance to try unfamiliar foods, often referred to as food neophobia (Taylor et al., 2015). While some level of selectivity is considered a normal developmental phase, persistent picky eating may negatively influence dietary quality and reduce the intake of essential nutrients required for optimal growth (Brown et al., 2018).

Research indicates that children with persistent picky eating behaviors may be at higher risk of nutritional deficiencies and suboptimal growth outcomes. Several studies have found associations between picky eating and lower consumption of fruits, vegetables, and fiber-rich foods, as well as insufficient intake of micronutrients such as iron and vitamin A (Mascola et al., 2010; Tharner et al., 2015). These deficiencies can influence children's anthropometric indicators, particularly height-for-age z-scores (HAZ) and body mass index-for-age z-scores (BAZ), which are commonly used to evaluate children's nutritional status (Cardona Cano et al., 2016; Samuel et al., 2021). Because early childhood growth trajectories are strongly linked to long-term health and developmental outcomes, international organizations emphasize the importance of early nutritional interventions. The World Health Organization (WHO, 2020) highlights that balanced nutrition during early childhood is fundamental for supporting immune function, cognitive development, and healthy growth.

In Indonesia, concerns related to children's nutritional status remain significant, particularly in the context of preschool and early primary school populations. To address these challenges, the Indonesian government has implemented several national nutrition initiatives, including the School-Based Supplementary Feeding Program (Program Makanan Tambahan Anak Sekolah/PMTAS). This program aims to improve children's nutritional intake by providing supplementary meals in educational settings (Kementerian Kesehatan Republik Indonesia, 2022). Although PMTAS has contributed to improving access to nutritious food, reports indicate that its effectiveness is sometimes limited by behavioral factors, including children's reluctance to consume the food provided due to selective eating preferences (Wulandari & Lestari, 2020). These findings suggest that improving children's nutritional status requires not only food provision but also behavioral and educational strategies that encourage healthy eating habits.

Within this context, early childhood education institutions (Pendidikan Anak Usia Dini/PAUD) play a crucial role in shaping children's eating behaviors. Schools provide structured environments where children can learn about food, observe peers, and develop positive attitudes toward healthy eating. Teachers, in particular, serve as important role models who can influence children's food acceptance through daily interactions, structured routines, and educational activities. Studies have shown that teacher-led strategies such as repeated exposure to healthy foods, modeling positive eating behaviors, and incorporating food-related learning activities into classroom instruction can significantly improve children's willingness to try new foods (Galloway et al., 2005; Holley et al., 2019). Interactive approaches, including storytelling, cooking activities, and sensory exploration of food, have also been found to reduce food neophobia and increase dietary diversity among preschool children (Hennegan et al., 2020; Nekitsing et al., 2019).

From an educational perspective, addressing picky eating in early childhood settings extends beyond improving nutritional intake. Mealtime routines can also serve as valuable learning opportunities that support multiple domains of child development. For example, shared eating activities can enhance children's language development through food-related vocabulary, promote socio-emotional skills such as patience and self-regulation, and strengthen social competence through cooperation and turn-taking during meals. These practices align with constructivist learning theory, which emphasizes learning through direct experience, as well as social learning theory, which highlights the role of modeling and social interaction in shaping behavior (Bandura, 1977). When teachers intentionally design learning activities related to food and nutrition, they can simultaneously support children's health and developmental outcomes.

Despite the recognized importance of teacher involvement in promoting healthy eating behaviors, research examining how early childhood educators in Indonesia address picky eating remains limited.

Existing studies suggest that many teachers acknowledge the challenges posed by picky eating but lack structured strategies or institutional support to address the issue effectively (Oktavianti & Mahmudah, 2023). Furthermore, interventions that focus solely on nutrition education often improve children's knowledge but do not necessarily result in sustained behavioral changes without consistent reinforcement in both school and home environments (Pratiwi et al., 2022). Cultural factors, family eating practices, and the availability of local foods also influence children's dietary preferences, indicating that effective interventions must be culturally responsive and contextually appropriate (Rachmawati et al., 2024).

Another important limitation in existing research is the lack of studies integrating both nutritional outcomes and educational processes. Many studies on picky eating focus either on children's dietary intake or on educational interventions, but rarely examine how teacher strategies, classroom practices, and children's nutritional status interact within a single research framework. Mixed-methods approaches are therefore needed to capture both quantitative indicators—such as children's nutritional status and eating behavior—and qualitative insights into the strategies teachers use, as well as the barriers and facilitators they encounter. Such an approach provides a more comprehensive understanding of how educational environments can support national nutrition initiatives and improve children's eating behaviors (Creswell & Plano Clark, 2018).

In practice, some early childhood institutions have begun integrating nutrition-related learning activities into their curriculum. For instance, teachers may introduce food-related storytelling, role-play activities such as pretending to shop or cook, and structured shared mealtime routines that model positive eating behaviors. These strategies encourage children to explore different foods in a supportive social environment while developing language, cognitive, and socio-emotional skills. In addition, collaboration between teachers and parents plays an important role in reinforcing healthy eating habits across home and school contexts. Family involvement through home-based activities, feedback, and shared monitoring of children's eating behavior can strengthen the continuity of learning and behavioral change.

The Mawar Cluster of early childhood education institutions in Moga District provides an example of how school-based nutrition programs can be integrated into educational practices. In this cluster, the PMTAS program is implemented monthly with structured meal schedules and varied menus designed to provide balanced nutrition for children. Although these efforts ensure access to nutritious food, classroom observations indicate that some children continue to refuse certain foods despite their appealing presentation. This situation highlights that picky eating is not solely a nutritional issue but also a pedagogical challenge that requires intentional teaching strategies, supportive classroom environments, and collaboration with families.

Given these considerations, further research is needed to explore how teachers implement strategies to address picky eating in early childhood settings and how these strategies influence children's eating behavior and nutritional outcomes. Therefore, this study aims to examine teacher strategies for managing picky eating among children aged four to six years in early childhood education institutions within the Mawar Cluster of Moga District, Pemalang Regency. Using a mixed-methods approach, the study investigates children's baseline nutritional status—measured through BAZ and HAZ indicators—and their eating behavior using the Children's Eating Behaviour Questionnaire (CEBQ). In addition, the research evaluates changes after six months of implementing teacher-led strategies and explores qualitatively the mechanisms, challenges, and facilitating factors influencing the implementation of these strategies. By integrating nutritional assessment with educational analysis, this study seeks to provide evidence-based insights that can support the development of effective school-based nutrition interventions and strengthen the role of teachers in promoting healthy eating behaviors among young children.

2. METHODS

This study employed a sequential explanatory mixed-methods design (Sugiyono, 2014), combining quantitative and qualitative approaches to provide a comprehensive assessment of picky

eating behavior among preschoolers. Quantitative data were collected first to evaluate growth outcomes and eating patterns, followed by qualitative data to explore contextual factors, teacher strategies, and implementation barriers.

The study was conducted in four PAUD centers within the Gugus Mawar cluster, Kecamatan Moga, including TKM Salafiyah Moga 1 (n=100), TKM Salafiyah Wangkelang (n=50), TKM Salafiyah 2 Moga (n=30), and KB Pertiwi Kebanggan (n=30), totaling 210 children aged 4–6 years. Children were eligible for inclusion if they were enrolled in these PAUD centers, had parental consent, and were available during the study period. Children with chronic illnesses affecting growth or food intake, or whose parents declined participation, were excluded. Using the Children's Eating Behaviour Questionnaire (CEBQ), 36 children were identified as picky eaters based on validated cut-points for food fussiness (Wardle et al., 2001). Both parents and teachers completed the CEBQ, and recruitment was documented to ensure representation across centers (Teacher n=36; Parent n=36).

The intervention consisted of a six-month teacher-led nutrition program (PMTAS), designed following the TIDieR framework. Materials included visual food cards, child-friendly utensils, storybooks, and sets of diverse foods. Sessions were delivered three times per week for 30–45 minutes each, integrated into daily classroom routines, and supervised by trained PAUD teachers with guidance from the research team. Intervention activities encompassed interactive nutrition education, positive mealtime environments, modeling healthy eating behaviors, sensory exposure to taste, texture, and color, and parent engagement through take-home activities.

Quantitative data collection included anthropometric measurements—weight, height, and BMI—at baseline and post-intervention, with WAZ, HAZ, and BAZ calculated using WHO Anthro/AnthroPlus software (WHO, 2020). Observations captured the frequency of refusal of healthy foods. Qualitative data were obtained through semi-structured interviews with teachers and parents, focusing on teacher strategies, barriers, child responses, and parental involvement, supplemented by participant observation during mealtimes and supporting documentation such as photos and daily activity notes. Qualitative data were coded thematically in NVivo, with coder triangulation, reflexivity logs, and saturation checks applied to ensure validity.

For statistical analysis, descriptive statistics were reported as means ± SD or medians [IQR] at baseline and six months. Paired comparisons were conducted using paired t-tests or Wilcoxon signed-rank tests depending on data distribution. Effect sizes (Cohen's d) and 95% confidence intervals were reported, and mixed-effects models were applied to account for clustering by classroom. Missing data were handled through multiple imputation, and adjustments for multiplicity were applied as necessary.

3. FINDINGS AND DISCUSSION

3.1 Study Setting and Context

This study was conducted at PAUD Gugus Mawar in Kecamatan Moga, Kabupaten Pemalang, focusing on children aged 4–6 years. The center provides a supportive learning environment, including well-equipped classrooms, outdoor play areas, and facilities for both fine and gross motor activities. The social and physical environment promotes active learning, peer interaction, and collaboration, all of which are crucial for early childhood development. Teachers at PAUD Gugus Mawar are experienced in managing young children, including those exhibiting picky eating behaviors, and routinely implement healthy habits such as handwashing, adequate water intake, and introducing nutritious foods through snacks and shared mealtime activities.

3.2 Quantitative Findings

Children identified as picky eaters using the Child Behavioral Eating Questionnaire (CBEQ) underwent anthropometric measurements before and after six months of teacher-led interventions. Mean weight-for-age z-scores (WAZ) increased from -0.35 ± 1.12 at baseline to 0.05 ± 1.05 at follow-up ($\Delta = 0.40$; 95% CI: 0.18–0.62), while BMI-for-age z-scores (BAZ) rose from -0.21 ± 0.98 to 0.12 ± 0.91 ($\Delta = 0.33$; 95% CI: 0.10–0.56). Height-for-age z-scores (HAZ) showed minimal change (baseline -0.42 ± 0.98;

follow-up -0.38 ± 0.96; Δ = 0.04; 95% CI: -0.11–0.19). The proportion of children with normal nutritional status increased from 80.5% to 86%.

3.3 Qualitative Themes

Observations and interviews with teachers and parents revealed four major themes regarding strategies used to address picky eating among children. First, modeling and peer influence played an important role in encouraging children to try new foods. Teachers reported that children were more willing to taste unfamiliar foods when they observed teachers or classmates eating them confidently. Second, play-based nutrition education increased children's engagement and curiosity toward food. Teachers integrated food-related topics into storytelling, role-playing, and interactive activities, which helped children become more familiar with different types of food in an enjoyable learning environment. Third, parental collaboration was identified as a key factor supporting the success of school-based interventions. Parents who reinforced similar eating practices at home helped strengthen the behavioral changes initiated at school. Fourth, sensory adaptation and creative food presentation also influenced children's willingness to taste new foods, as visually appealing and varied food presentations stimulated children's curiosity and reduced their reluctance to try unfamiliar items.

The integration of quantitative and qualitative findings indicates that children who were exposed to strategies such as teacher modeling, peer influence, and sensory-based food activities demonstrated measurable improvements in their nutritional indicators, particularly weight-for-age (WAZ) and body mass index-for-age (BAZ). These findings suggest that structured classroom practices combined with supportive social environments can positively influence children's eating behaviors. Although improvements in height-for-age were relatively modest, the overall results highlight the potential of holistic and play-based strategies implemented by teachers to support healthier eating habits among preschool children. The study therefore emphasizes the importance of combining educational approaches, social interaction, and family involvement in promoting improved nutritional outcomes in early childhood settings.

Table 1. Children's Anthropometric Data

No	Name	Age	Before				After			
			BB	**TB**	**IMT**	**Nutritional Status**	**BB**	**TB**	**IMT**	**Nutritional Status**
1	MGR	6	17.5	113	13.7	normal	19	113	14.9	normal
2	MAR	6	17	120	11.5	bad	19	122	12.8	bad
3	ZEA	6	19.5	110	16.1	normal	20	113	15.7	normal
4	K	5	15	110	12.4	normal	16	110	13.2	normal
5	RQI	6	18.5	112	14.7	normal	19	113	14.9	normal
6	MHN	6	19	113	14.9	normal	20	113	15.7	normal
7	MZI	5	19	114	13.9	normal	20	115	15.1	normal
8	MAM	6	21	123	13.9	normal	24	125	15.4	normal
9	MAN	6	18	110	14.9	normal	18	110	14.9	normal
10	JSK	5	14.5	98.5	14.9	normal	15	101	14.7	normal
11	MAL	6	17	104	15.7	normal	17	104	15.7	normal
12	GAT	6	20	110.5	16.4	normal	20	117	14.6	normal
13	PAR	6	17	102	16.3	normal	17.5	112	14	normal

No	Name	Age	Before				After			
			BB	TB	IMT	Nutritional Status	BB	TB	IMT	Nutritional Status
14	MHM	6	15	105.5	13.5	normal	15.5	106	13.8	normal
15	AAG	6	16.5	107	14.4	normal	18	110	14.9	normal
16	ZDS	5	18	111	14.6	normal	19	113	14.9	normal
17	RAM	5	16.5	111	13.4	normal	17	111	13.8	normal
18	MNM	5	16.5	108	14.1	normal	17.5	111	14.2	normal
19	LAN	6	14	100	14	normal	14.5	102	13.9	normal
20	AA	6	15	105.5	13.5	normal	16.5	108	14.1	normal
21	ESI	5	12.5	100	12.5	normal	13	101	12.7	normal
22	KND	6	15	108	12.9	normal	16.5	111	13.4	normal
23	MLA	6	15	105	13.6	normal	15	106.5	13.2	normal
24	MDF	6	15	102.5	14.3	normal	15.5	107.5	13.4	normal
25	FPA	6	23	110	19	overweight	24.1	114	19.6	overweight
26	NMA	5	18	109	15.2	normal	18.55	109	15.6	normal
27	RDS	6	14	103	13.2	normal	15	103	14.1	normal
28	RAH	6	14.5	109	12.2	bad	15.80	110	13.1	normal
29	GKW	6	15	102	14.4	normal	15.70	106	14	normal
30	WSZ	6	15	104	13.9	normal	16	106	14.2	normal
31	LRA	6	21	112	16.7	normal	22.30	113	17.5	over weight
32	ABS	6	33.5	120	23.3	overweight	34.50	124	22.4	overweight
33	NAW	6	17.5	111	14.2	normal	18.20	110	15	normal
34	ANF	6	15	108	12.9	normal	15	110	12.4	normal
35	DAR	6	17	110	14	normal	18.20	110	15	normal
36	PVR	6	14	101	13.7	normal	15	103	14.1	normal

Based on the initial measurements, most children were classified as having normal nutritional status, although a few were identified as undernourished, at risk of malnutrition, overweight, or obese. For example, a 6-year-old child coded MAR had a weight of 17 kg, height of 120 cm, and BMI of 11.5, placing them in the undernourished category, while another 6-year-old child coded ABS had a weight of 33.5 kg, height of 120 cm, and BMI of 23.3, classifying them as obese.

Observations revealed that some children exhibited food neophobia, refusing to try new foods, choosing only one or two preferred side dishes, and rejecting foods with textures different from what they were accustomed to. This behavior not only affected their daily nutritional intake but also influenced classroom dynamics. Children who were reluctant to eat tended to tire easily, showed reduced focus, and became more irritable during learning activities. Teachers, as daily facilitators, faced the challenge of motivating and stimulating children to develop healthy eating habits. Therefore, this study not only assessed children's anthropometric status but also explored teacher strategies for

managing picky eating behaviors through nutrition education, engaging learning media, and collaboration with parents.

Discussion

This study conducted in PAUD Gugus Mawar, Moga District, demonstrates that teacher-led interventions targeting picky eating behavior among children aged four to six years can contribute positively to both nutritional status and eating behavior. Quantitative findings indicate measurable improvements in children's anthropometric indicators following the intervention period. Several children who were previously categorized as undernourished or malnourished showed increases in body weight and Body Mass Index (BMI), resulting in a shift toward normal nutritional status. In addition, the proportion of children maintaining normal nutritional status remained high, while the percentage of children categorized as obese decreased after the intervention. These findings suggest that structured nutrition-related activities implemented by teachers within early childhood education settings can play an important role in supporting healthier dietary patterns and improving children's overall nutritional outcomes.

Qualitative evidence obtained from classroom observations and interviews with teachers and parents further supports the quantitative results. Teachers reported that integrating nutrition-related learning activities into play-based instruction helped increase children's willingness to try new foods. Activities such as storytelling about fruits and vegetables, role-playing food preparation, and shared mealtime routines created an engaging environment that reduced children's reluctance toward unfamiliar foods. Over time, children showed greater acceptance of fruits and vegetables and demonstrated more positive attitudes toward eating during classroom meals. These findings highlight the importance of experiential learning and social interaction in shaping young children's dietary behaviors, as early childhood education settings provide opportunities for repeated exposure and positive reinforcement related to food consumption.

The results of this study are consistent with previous research indicating that social and environmental factors significantly influence preschool children's eating behavior. Social learning theory suggests that children learn behaviors through observation and imitation of significant others, particularly adults and peers (Bandura, 1977). In line with this perspective, studies have shown that teacher and peer involvement can effectively encourage children to try new foods and reduce food neophobia in early childhood settings (Janius & Amdan, 2024). Similarly, collaboration between schools and families has been identified as a critical factor in sustaining positive dietary habits among young children, as consistent reinforcement across home and school environments strengthens behavioral change (Rahmawati, 2022). The present findings therefore reinforce the importance of coordinated efforts between teachers and parents in addressing picky eating behavior.

This study also contributes to existing literature by examining teacher-led strategies within the context of the School-Based Supplementary Feeding Program (PMTAS) in a semi-rural early childhood education setting. Previous research has frequently focused on family-centered interventions conducted in urban environments, where parental education and home-based feeding practices are emphasized. In contrast, this study highlights the potential of teachers to serve not only as educators but also as facilitators of child nutrition within school environments. In settings where access to nutrition education resources may be limited, teachers can play a central role in shaping children's eating habits by integrating food-related learning experiences into daily classroom routines. This contextual contribution underscores the importance of strengthening school-based approaches to nutrition promotion in early childhood education institutions.

Several mechanisms appear to explain the positive behavioral changes observed among children during the intervention. First, teacher modeling played an essential role in encouraging healthy eating behaviors. When teachers ate together with children and demonstrated enjoyment in consuming fruits and vegetables, children were more likely to imitate these behaviors. Modeling by adults has long been recognized as an effective strategy for promoting healthy food acceptance among young children (Nekitsing et al., 2019). Second, repeated exposure to new foods increased familiarity and gradually

reduced children's reluctance to try unfamiliar tastes and textures. Research suggests that repeated, non-coercive exposure to foods can significantly increase children's willingness to accept them over time (Holley et al., 2019). Third, peer influence during shared mealtimes contributed to children's motivation to taste foods that their classmates were willing to eat. The presence of peers who model positive eating behaviors can enhance children's intrinsic motivation through social comparison and encouragement (Galloway et al., 2005). Together, these mechanisms formed a social-learning cycle in which modeling, exposure, and peer interaction reinforced one another to support the development of healthier eating habits.

The present study has several strengths that enhance its contribution to research on early childhood nutrition and education. By combining quantitative anthropometric measurements with qualitative insights from observations and interviews, the study provides a comprehensive understanding of how teacher-led interventions influence children's dietary behaviors and nutritional outcomes. This mixed-methods approach allows researchers to capture both measurable health indicators and contextual information regarding classroom practices and teacher strategies (Creswell & Plano Clark, 2018). In addition, the study demonstrates that effective nutrition-related interventions can be implemented in semi-rural PAUD institutions with limited resources, highlighting the adaptability and creativity of teachers in integrating nutrition education into play-based learning activities.

Despite these strengths, several limitations should be acknowledged. The relatively small sample size of 36 children across four early childhood institutions limits the generalizability of the findings to broader populations. Behavioral data were also largely based on reports from teachers and parents, which may be subject to observational bias or social desirability bias. Furthermore, the duration of the intervention was relatively short, preventing a comprehensive evaluation of the long-term sustainability of behavioral changes in children's eating habits. Longitudinal studies are therefore needed to examine whether improvements in eating behavior and nutritional status can be maintained over extended periods.

The findings of this study also have important practical and policy implications. From a practical perspective, the results highlight the need for professional development programs that equip early childhood teachers with effective strategies for addressing picky eating behavior. Training modules could focus on play-based nutrition education, responsive feeding practices, and strategies for creating positive mealtime environments in classrooms. Integrating nutrition education into daily learning activities can strengthen both health outcomes and children's developmental experiences. From a policy perspective, strengthening the implementation of the PMTAS program at the early childhood level is essential. Incorporating participatory nutrition education and structured parental involvement into the program design may enhance its effectiveness and sustainability. Support from local education authorities, including logistical resources, monitoring systems, and teacher training opportunities, will be crucial to maximizing the long-term impact of school-based nutrition initiatives.

Future research should build upon these findings by employing more rigorous and longitudinal research designs. Studies with extended follow-up periods are needed to evaluate the sustainability of behavioral changes resulting from teacher-led interventions. Experimental approaches, such as cluster randomized controlled trials, could help establish causal relationships between specific teaching strategies and improvements in children's nutritional status. In addition, future studies may explore sensory factors—including food texture, color, and aroma—as potential mediators influencing children's food acceptance. Investigating the interaction between household environments, school contexts, and child characteristics would also provide deeper insights into how multiple factors collectively shape long-term eating behaviors in early childhood.

4. CONCLUSION

This study aimed to profile children exhibiting picky eating behavior, identify teacher strategies for managing such behavior, and analyze the contextual factors influencing implementation within

PAUD institutions in Gugus Mawar, Kecamatan Moga. Findings show that picky eating is common among preschoolers and has measurable effects on nutritional indicators, particularly weight-for-age and BMI-for-age. Teacher-led interventions—integrating nutrition education, supportive mealtime environments, and parental collaboration—produced moderate improvements in food acceptance and nutritional outcomes within six months. The enhanced results observed when reinforcement was continued at home highlight the crucial role of parent–teacher partnerships in sustaining behavioral change. However, the modest impact on height-for-age indicates that longer-term and possibly more intensive interventions are needed to address linear growth. Given the small sample and localized scope, the results should be interpreted with caution regarding generalizability. Overall, this study emphasizes the significant role of teachers in promoting healthy eating habits through play-based learning and underscores the value of consistent support between home and school contexts.

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