Indonesian Journal of Global Health Research
Volume 8 Number 4, August 2026
e-ISSN 2715-1972; p-ISSN 2714-9749
https://jurnal2.globalhealthsciencegroup.com/index.php/IJGHR

EFFECTIVENESS OF BRAINSTORMING-BALANCED HEALTH EDUCATION IN IMPROVING NUTRITIONAL DIETS IN STUNTED TODDLERS

Daratullaila*, Agrina, Erika
Magister Keperawatan, Universitas Riau, Jl. Pattimura, Cinta Raja, Sail, Pekanbaru, Riau 28127, Indonesia
*daratullaila8858@grad.unri.ac.id

ABSTRACT
Stunting is a chronic nutritional problem that affects children's growth and development due to eating patterns that do not align with balanced nutrition. Mothers, as primary caregivers, play a crucial role, so effective and participatory nursing interventions are essential. This study used Dorothy E. Johnson's Behavioural System Theory as an environmental stimulus that influences behavioural systems. The objective of this study was to analyse the effect of health education using the brainstorming method on balanced nutritional eating patterns in stunted toddlers. This study used a quasi-experimental design with a one-group pretest-post-test approach. The health education intervention was conducted over three weeks through three stages. The Round Robin brainstorming method was used. The study sample consisted of 38 mothers of stunted toddlers, selected using purposive sampling. The measurement tool employed the Food Frequency Questionnaire (FFQ), which underwent validity and reliability tests, showing good content validity and an acceptable reliability coefficient (Cronbach's alpha = 0.8). The research showed that the majority of children's eating patterns before the brainstorming method were in the poor category (76.3%), and after the intervention, 63.2% of toddlers' eating patterns were in the good category. The Wilcoxon test results indicated a significant effect of health education using the brainstorming method on changes in the dietary patterns of stunted toddlers. Health education using the brainstorming method had a significant effect on improving balanced nutrition in stunted toddlers.

Keywords: balanced nutrition; brainstorming; dietary patterns; health education; purposive sampling; stunting; toddlers

How to cite (in APA style)
Daratullaila, D., Agrina, A., & Erika, E. (2026). Effectiveness of Brainstorming-Balanced Health Education in Improving Nutritional Diets in Stunted Toddlers. *Indonesian Journal of Global Health Research*, *8*(4), 487–494. https://doi.org/10.37287/ijghr.v8i4.1507.

INTRODUCTION

Stunting is a growth disorder in toddlers caused by chronic malnutrition during the first 1,000 days of life (HPK), from conception to two years of age. This condition is characterized by height that is below the standard deviation (-2SD) for a given age. Stunting has the potential to have serious long-term impacts on children, including impaired physical and intellectual development, as well as a reduced quality of life. Stunting is also closely linked to an increased risk of non-communicable diseases and limited educational attainment, which exacerbates the cycle of poverty in the future (WHO, 2023). In Indonesia, the prevalence of stunting remains high, despite significant declines. WHO data in 2022 showed that approximately 148 million toddlers worldwide are stunted, with Indonesia ranking fifth with 23 million toddlers, or 27.7% of the total number of stunted toddlers (WHO, 2024). Although the prevalence of stunting in Indonesia decreased from 24.4% in 2021 to 21.6% in 2022, this figure is still relatively high and poses a major challenge in improving the quality of child health (Ministry of Health of the Republic of Indonesia, 2023).

The primary cause of stunting is malnutrition that occurs during the critical growth period of the first 1,000 days of life. Furthermore, stunting is influenced by various other factors, such as repeated infections, poor diet, and limited access to clean water, sanitation, and adequate health services. Socioeconomic factors, maternal education level, and the nutritional status of pregnant women also play a significant role in exacerbating stunting in children (WHO, 2023). Stunting has

short-term impacts on a child's physical growth and intelligence, as well as long-term impacts on productivity, the risk of non-communicable diseases, and limited education, contributing to a cycle of poverty in the future (WHO, 2023). Stunting in children can cause neurological disorders that affect memory, focus, and learning ability. Malnutrition hinders proper brain development, thus hampering a child's intelligence and having long-term impacts on their learning process (Jariyah, 2024). Stunting hinders a child's physical, cognitive, motor, and socio-emotional growth, especially during the golden period. This can have permanent effects into adulthood, although genetic and environmental factors also influence cognitive development (Laily and Indarjo, 2023).(Asra Laily et al., 2023).

Mothers, as primary caregivers, play a crucial role in influencing their children's eating patterns and health. However, in some remote and coastal areas, particularly those with low economic levels, there is still a lack of knowledge about the importance of balanced nutrition and healthy feeding practices for children. This exacerbates the prevalence of stunting in Indonesia, where many toddlers do not receive optimal nutrition during their growth period. One approach to addressing stunting is through health education that involves parents, especially mothers, in the learning process about healthy and nutritious eating patterns for children. One educational method that can be implemented is brainstorming. This participatory approach allows for active discussion, the exchange of ideas, and collaborative problem-solving to create creative solutions relevant to each family's circumstances.

Brainstorming has been proven effective in increasing parents' knowledge about nutrition and healthy eating patterns and can motivate them to change unhealthy feeding behaviors and habits. In the context of stunting, the use of brainstorming can have a positive impact on increasing mothers' understanding of the importance of providing nutritious food for toddlers. Previous research has shown that education through brainstorming can increase mothers' knowledge about stunting and how to prevent it, as well as provide them with skills to manage their children's diets more healthily (Pantiawati et al., 2023; Wahyurin et al., 2019.

Based on the results of an initial survey conducted by researchers at one of the integrated health posts (Posyandu) within the Batu 10 Community Health Center (Puskesmas) working area, 10 mothers of stunted toddlers were interviewed. Seven toddlers had poor eating habits, characterized by their consumption of only minimal amounts of carbohydrates and protein. The field study revealed that the educational methods employed by health workers primarily focused on providing information on balanced nutrition and healthy eating patterns for toddlers. However, due to economic constraints in the fishing community, children tended to consume only rice with fish and no vegetables. Given the importance of parents' role in feeding their children, a brainstorming study was conducted to improve balanced nutritional eating patterns for stunted toddlers. This method allows for active parental involvement in discussions and sharing experiences, leading to the discovery of creative and targeted solutions to improve eating habits and optimally meet children's nutritional needs.

METHOD

This research used a quasi-experimental design with a one-group pretest-post-test approach to evaluate the effectiveness of health education using the brainstorming method in improving balanced nutrition eating patterns among stunted toddlers in the Batu 10 Community Health Centre Working Area, Tanjung Pinang. The intervention was conducted over three weeks, with three stages of health education implemented using the Brainstorming Round Robin method. This method allows each mother to participate in structured discussions. Each participant provides ideas and solutions on how to improve their toddler's diet The population is all mothers with stunted toddlers in the working area of the Batu 10 Community Health Centre, Tanjung Pinang, consisting of 115 people. The sample used a combination of proportional and purposive sampling, resulting in 38

respondents. The sample was taken proportionally from two sub-districts, namely Air Raja and Pinang Kencana, as well as three integrated health service posts in the area. The main outcome measured in this study was changes in the dietary patterns of stunted toddlers, which were assessed using a Food Frequency Questionnaire (FFQ). This questionnaire provided detailed data on the frequency of food consumption by toddlers before and after the intervention. The pre-test and post-test data were analysed using the Wilcoxon test to determine the significance of changes in the dietary patterns of stunted toddlers after receiving health education Data collection was conducted by distributing pre-test and post-test questionnaires to measure toddlers' eating patterns, as well as educational interventions using brainstorming methods for mothers of toddlers. The data obtained was then statistical test used was the Wilcoxon test to determine whether there was a significant difference between toddlers' eating patterns before and after the health education intervention.

RESULT

Table 1.
Respondent characteristics (n= 38)
Distribution of Respondent Characteristics Based on Mother's Age, Mother's Education, Mother's Occupation(n=38)

Respondent characteristics	f	%
Mother's age		
26-36 Early adulthood	15	39.5
37-45 Late adulthood	23	60.5
Mother's education		
Elementary school	7	18.4
Junior high school	6	15.8
High school	23	60.5
Bachelor's degree	2	5.3
Mother's occupation		
Employed	2	5.3
Not employed	36	94.7

Based on Table 1.the majority of respondents were in their late adulthood (37–45 years old), totalling 23 people (60.5%). Most mothers had a high school education, totalling 23 people (60.5%), and almost all mothers were unemployed, totalling 36 people (94.7%).

Table 2
Characteristics of Child Respondents
Based on Age, Gender, and Nutritional Statusin (n=38)

Respondent characteristics	F	%
Child Age		
13-24 Months	14	36.8
25-36 Months	11	28.9
> 36 Months	13	34.2
Gender		
Male	23	60.5
Female	15	39.5
Nutritional Status		
Severely stunted	26	68.4
Stunted	12	31.6

Based on Table 2 the majority of children are aged 13-24 months, 14 people (36.8%), the majority of children are male, 23 people (60.5%), and the majority of children are very short, 26 people (68.4%).

Table 3
Pre-Test and Post-Test Diet Patterns

Categorical Diet Patterns of Toddlers	Pre-Test		Post-Test	
	f	%	f	%
Good	0	0	24	63,2
Fair	9	23,7	14	36,8
Poor	29	76,3	0	0

Table 3 presents the distribution of toddlers' diet patterns before and after a health education intervention using the brainstorming method. Before the intervention, 29 toddlers (76.3%) fell into the Poor dietary pattern category, while 9 toddlers (23.7%) were categorized as Fair, and none were classified as Good. Following the intervention, the distribution shifted: 24 toddlers (63.2%) were categorized as having Good dietary patterns, 14 (36.8%) as Fair, and none remained in the Poor category. This illustrates an improvement in diet quality among toddlers after the intervention

Table 4
Difference in Mean Health Education and the Brainstorming Method
In Improving Balanced Nutritional Diets in Stunted Children

Pola makan	Kelompok Intervensi								P value
	Pre Test				*Post Test*				
	Mean	Min	Max	SD	Mean	Min	Max	SD	
Pretest – posttest	1.24	1	2	0,431	2.63	2	3	0,489	0,000

Based on Table 4 the average dietary pattern score for respondents in the pretest phase was 1.24, indicating that most respondents had an inadequate to adequate diet before the health education intervention using the Brainstorming method. The standard deviation of 0.431 indicates relatively small variation in the data, as the standard deviation is smaller than the mean. A minimum value of 1 and a maximum value of 2 indicate that no respondents were categorized as having a good diet. In the posttest, the average score for respondents increased to 2.63, indicating that after the intervention, there was a change in the respondents' dietary patterns, placing them in the adequate to good dietary pattern category. The standard deviation of 0.489 indicates relatively small data variation, as the standard deviation is smaller than the average. A minimum score of 2 and a maximum score of 3 indicate that there were no more respondents in the inadequate dietary pattern category after the intervention.

Tabel 5

Improved eating patterns after being given brainstorming education

Pola Makan	N	Mean Rank	Sum Of Rank	Nilai	p-value
Positive Rank	38	19,50	741.00	-5,565	0,000

Based on the results of the Wilcoxon test analysis presented in Table 5 it is known that all research respondents (N = 38) experienced an increase in the consumption pattern of balanced nutritional food in stunted toddlers after being given a health education intervention using the brainstorming method. This is indicated by the number of positive ranks from 38 respondents, while negative ranks and ties are each worth 0, indicating that no respondents experienced a decrease or no change in eating patterns after the intervention. The average value (Mean Rank) of 19.50, with a number of ranks (Sum of ranks) of 741.00 indicates that the changes that occur are consistent and lead to an increase in balanced nutritional eating patterns. The results of the Wilcoxon Test produced a Z value of -5.565 indicating a difference in balanced nutritional eating patterns in stunted toddlers before and after the health education intervention using the brainstorming method. The p-value of 0.000 is smaller than 0.05 so there is a statistically significant effect of health education with the brainstorming method on balanced nutritional eating patterns in stunted toddlers.

DISCUSSION

Dietary Patterns of Stunting Toddlers After Providing Health Education Using the Brainstorming Method for Parents

This study shows that after providing health education using the brainstorming method to parents, the majority of stunted toddlers showed improvements in their eating habits. A total of 63.2% of respondents successfully implemented a balanced diet, while 36.8% were in the adequate category. This indicates that health education using the brainstorming method is effective in improving nutritionally balanced eating habits in stunted toddlers, as reflected in changes in parental feeding behavior.

Based on Dorothy E. Johnson's Behavioral Systems Model, these changes improve the function of the ingestive subsystem, specifically eating behavior and nutritional fulfillment. This education acts as an external stimulus that helps parents actively modify their children's eating behaviors, which in turn improves nutritional status and prevents stunting. Previous research by Banowo and Hidayat (2021) also showed that health education improves feeding practices by 14%.(Banowo & Hidayat, 2021). Education involving group discussions and sharing experiences among mothers improves mothers' understanding and skills in meeting their children's nutritional needs, particularly regarding diet and regular mealtimes. This research also supports the finding that a diet that does not meet a child's nutritional needs can lead to stunting (Mouliza and Darmawi, 2022).(Mouliza R & Darmawi, 2022).

A balanced diet, including carbohydrates, protein, fat, vitamins, and minerals, is crucial for a child's growth and development. Inappropriate feeding can hinder a child's linear growth (Samosir et al., 2023)(Samosir et al., 2023), and good feeding practices help prevent stunting by paying attention to the frequency and types of food provided (Handayani et al., 2023; Suling, 2024). Improved dietary patterns after education indicate that mothers become more skilled at preparing more varied and nutritious menus, which can optimally meet children's nutritional needs and support their growth. This aligns with research by Banowo and Hidayat (2021), which states that adequate feeding supports better nutritional status in toddlers.

The Effect of Providing Health Education Using the Brainstorming Method on the Dietary Patterns of Stunted Toddlers

The results of this study indicate a significant effect of providing health education using the brainstorming method on balanced nutritional eating patterns in stunted toddlers. The Wilcoxon statistical test yielded a p-value of 0.000 ($p<0.05$), indicating that H0 was rejected. Therefore, it can be concluded that the health education intervention using the brainstorming method is effective in improving the dietary patterns of stunted toddlers. The health education intervention using the brainstorming method was implemented over three weeks through three educational meetings. The brainstorming method was effective in improving dietary changes in stunted toddlers. This was evident from the post-test scores in the intervention group, which showed that 24 respondents (63.2%) experienced an improvement in the good category and 14 respondents (36.8%) showed a difference in the dietary patterns of stunted toddlers after the intervention. The implementation of this research was carried out directly at the respondents' homes, allowing the intervention to be implemented contextually by directly observing the varied menus during the feeding process and the types of food consumed by toddlers within the family environment.

In Dorothea E. Johnson's behavioral system theory, individuals are viewed as a behavioral system consisting of several interacting subsystems that aim to achieve balance. Imbalance in one subsystem can affect the function of other subsystems. The round robin method acts as an environmental stimulus that influences the mother's behavioral system as part of the toddler's immediate environment. The mother's active involvement in group discussions helps modify parenting behavior, especially in the eating behavior subsystem (ingestive), thereby creating a balance in the child's behavioral system. By implementing the round robin brainstorming method in balanced nutrition health education interventions, it supports changes in behavior in providing more effective eating patterns according to the results of this study, improving balanced nutritional eating patterns in stunted toddlers directly with behavior in meeting toddlers' nutritional needs.

An imbalance in the ingestive subsystem in toddlers, with a diet that does not comply with the principles of balanced nutrition, is one factor contributing to stunting. Through health education using the brainstorming method, mothers are provided with knowledge, understanding, and skills in preparing balanced nutritional menus, organizing meal schedules, and selecting food ingredients that meet toddlers' nutritional needs. This intervention plays a crucial role in meeting the nutritional

needs of toddlers, thus supporting improvements in nutritionally balanced diets. A child's diet must be able to meet energy needs and contain macro- and micronutrients, such as carbohydrates, protein, fat, vitamins, and minerals, tailored to the child's age and growth and development needs. Poor feeding practices can lead to low energy and nutrient intake, which impacts a child's linear growth. This condition results in children not receiving a balanced supply of energy and nutrients, resulting in stunted growth (Samosir et al., 2023).

Research shows that proper nutritional intake, particularly maternal feeding practices, is crucial for preventing stunting (Handayani et al., 2023).(Yuni Handayani et al., 2023) A good diet, with three meals a day, supports a child's health and nutritional status (Suling, 2024).(S Suling et al., 2024) The dependency subsystem of toddlers, who rely on their mothers or caregivers for nutritional needs, can be improved through balanced nutrition education using the brainstorming method. This method helps increase the mother's role in decision-making regarding toddler feeding, creates a sense of security, and improves regular eating patterns. The affiliative subsystem, which relates to the emotional connection between the child and caregiver, is also strengthened through positive interactions during the education process.

A more balanced diet enhances toddler development, supports the achievement subsystem, and reduces emotional problems or aggressive behavior that can arise from nutritional imbalances. Although the eliminative subsystem is not the primary focus, a good diet also supports optimal digestive function in toddlers. The sexual subsystem, which is related to identity development, is also influenced by adequate nutrition in early life. Brainstorming methods, particularly the round robin technique, are effective in increasing maternal participation, allowing them to share experiences and find solutions together to address challenges in feeding their toddlers. This approach has been shown to improve mothers' understanding of balanced nutrition, leading to behavioral changes that support better feeding practices.

Research by Banowo and Hidayat (2021) and Kristina (2021) confirms that repeated nutrition education can improve family feeding practices for stunted toddlers. The round-robin method requires each mother to take turns presenting ideas, which stimulates reflection and creativity, and strengthens confidence in decision-making. This method is effective in improving children's eating habits and preventing stunting, in line with other research findings (Magdalena, 2021). This study also showed that before the intervention, toddlers consumed more carbohydrates than protein, reflecting mothers' poor understanding of how to prepare a balanced menu. After the brainstorming method, mothers were better able to organize a balanced nutritional diet for their toddlers. This finding is supported by research by Budiarti et al. (2022),(K. Dewi Budiarti et al., 2022) which states that stunting is related to malnutrition in the first 1,000 days of life, and economic factors play a role in stunting (Sairah, 2023). Effective nutrition education, such as that conducted using the brainstorming method, increases mothers' knowledge of nutritious diets, helping to prevent stunting in toddlers. This method allows mothers to better understand the importance of a diet appropriate to their child's age and improve regular meal schedules.

CONCLUSION

This study shows that health education using the brainstorming method is effective in improving balanced nutritional eating patterns in stunted toddlers. This method successfully encourages the active participation of mothers as primary caregivers through discussions and collaborative problem-solving, which increases their knowledge and skills in selecting and serving foods according to their children's nutritional needs. Based on Johnson's Behavioral Systems Theory, providing appropriate stimuli can strengthen behavioral systems, encouraging adaptive behavioral changes. Therefore, the brainstorming method can be implemented as an effective intervention in preventing and addressing stunting at the family and community levels.

REFERENCES

Grady, J. S., Her, M., Moreno, G., Perez, C., & Yelinek, J. (2019). Emotions in storybooks: A comparison of storybooks that represent ethnic and racial groups in the United States. Psychology of Popular Media Culture, 8(3), 207–217.https://doi.org/10.1037/ppm0000185

Asra Laily, L., Indarjo, S., Ilmu Kesehatan Masyarakat, J., Ilmu Keolahragaan, F., & Negeri Semarang, U. (2023). 354 HIGEIA 7 (3) (2023) HIGEIA JOURNAL OF PUBLIC HEALTH RESEARCH AND DEVELOPMENT Literature Review: Dampak Stunting terhadap Pertumbuhan dan Perkembangan Anak. https://doi.org/10.15294/higeia/v7i3/63544

Banowo, A. S., & Hidayat, Y. (2021). Pengaruh Edukasi Gizi terhadap Praktik Pemberian Makan Pada Baduta Stunting di Kabupaten Bengkulu Utara. Jurnal Ilmiah Universitas Batanghari Jambi, 21(2), 765. https://doi.org/10.33087/jiubj.v21i2.1539

K. Dewi Budiarti, Eti Suliyawati, & Nuria. (2022). Hubungan Pola Pemberian Makan Dengan Kejadian Stunting Pada Balita Usia 24-59 Bulan di Kelurahan Sukamentri Kabupaten Garut. JURNAL MEDIKA CENDEKIA, 9(2).

Mouliza R, & Darmawi. (2022). HUBUNGAN POLA PEMBERIAN MAKAN DENGAN KEJADIAN STUNTING PADA BALITA USIA 12-59 BULAN DI DESA ARONGAN. Jurnal Biology Education, 10(1).

S Suling, C. I., Ariani, M., Hanik Fetriyah, U., Studi Ners, P., Kesehatan, F., Sari Mulia, U., Pramuka No, J., Luar, P., Selatan, K., & Studi Sarjana Keperawatan, P. (2024). HUBUNGAN POLA MAKAN DENGAN KEJADIAN STUNTING PADA BALITA. In JKJ): Persatuan Perawat Nasional Indonesia (Vol. 12).

Samosir, O. B., Radjiman, D. S., & Aninditya, F. (2023). Food consumption diversity and nutritional status among children aged 6-23 months in Indonesia: The analysis of the results of the 2018 Basic Health Research. PLoS ONE, 18(3 March). https://doi.org/10.1371/journal.pone.0281426

Yuni Handayani, T., Pramita Sari, D., & Rahayu Putri, M. (2023). Pengaruh pola makan terhadap kejadian stunting. CrossMark, 5(2), 497–502. https://ukinstitute.org/journals/ib|

World Health Organization. (2024). Global nutrition targets 2030: Stunting brief. World Health Organization

World Health Organization (WHO, 2023)

World Health Organization. (2023). Adult Age Group Classification. World Health Organization