

Investigating the Effectiveness of School-based Interventions (SBNIs) on Children's Nutrition Statuses and Healthy Habit Maintenance: A Literature Review

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Abstract

Childhood obesity and diet inadequacies are one of the most serious global health concerns to date, affecting over 340 million children (ages 5-19 years) worldwide. Effective health promotion and preventive measures are needed to address the serious health concerns affecting this population. School-based nutrition interventions (SBNIs) act as a potential avenue to support children's nutrition and life-long healthy habit maintenance by demonstrating nutrition knowledge and techniques to support healthy decision-making. This paper aims to investigate the effectiveness of SBNIs on nutrition and healthy habit maintenance for children between the ages of 5-19 years old. Literature was screened using the PubMed electronic database, yielding a total of 23 peer-reviewed articles to be included in this review. These studies highlighted that SBNIs that utilized multi-component approaches, elicited long-term and continuous implementation efforts, communal engagement, and provided educator support and effective resources indicated the highest amount of positive health outcomes and behaviours in children. Future research is needed to further investigate the long-term implementation of SBNIs, and future policies should work towards adopting similar strategies to help promote healthy livelihoods for all children worldwide.

Introduction

Childhood obesity and diet inadequacies are one of the most serious global health concerns to date, affecting over 340 million children (ages 5-19 years) worldwide [1]. Childhood is a critical age of development [2]. However, there is a notable increase in poor diets and reduced nutritional intake among this population, which can lead to serious health effects, including increased risks for heart disease, diabetes, and cancer, and impacts on brain development and growth [2,3]. Effective health promotion and preventive measures are needed to address health concerns associated with inadequate nutrition and healthy habit maintenance in children [2,3,12]. School settings are known to be influential in addressing children's eating patterns [2-4,12].

School-based nutrition interventions (SBNIs) act as a potential avenue to support children's nutrition and life-long healthy habit maintenance by providing nutrition knowledge and techniques to support healthy decision-making [2-4]. This paper aims to synthesize information related to the effectiveness of SBNIs on nutrition and healthy habit maintenance for children between the ages of 5-19 years old.

Methodology

The formal literature review was conducted using the PubMed electronic database. Keywords (Table 1) were utilized to increase search strategy relevance and rigor. Search criteria were limited to publications within a 20-year time period to capture a wide array of applicable sources.

#	PUBMED KEYWORD*	RESULT
1	Nutrition status[All Fields]	138,307
2	School-based[All Fields]	17,396
3	#1 AND #2	621
4	Intervention[Title/Abstract]	785,280
5	#3 AND #4	246

Table 1: Harvest Table

Inclusion Criteria	Exclusion Criteria
Studies examining the effectiveness of SBNIs	Studies that focused on specific populations (ex. children with disabilities, impoverished populations)
Males and females between the ages of 5-19 years	Literature that required accessing fees
English language publications	Parent/family-based interventions
Outcomes related to children's nutrition and healthy habits	Theses, Dissertations, commentaries, reflections, abstracts, conference proceedings, and/or research in progress
Publications between January 2002 to December 2022	

Table 2: Inclusion and Exclusion Criteria for the Eligibility Assessment

Results

A total of 246 articles were generated. The eligibility assessment (Table 2) resulted in 23 peer-reviewed articles (Figure 1). The studies selected for this review included eight randomized control trials [4,8,9,16-20], five

systematic reviews [2,5,6,12,22], four mixed-method designs [3,11,13,21], two Quasi-experimental designs [7,10], two clinical trials [14,23], one scoping review [24] and one prospective study [15]. Studies were selected to investigate the effectiveness of SBNIs for children ages 5-19 years [2-24]. Studies from across the world were included, and overall outcomes aimed at assessing children's nutritional statuses and healthy habit maintenance [2-24].

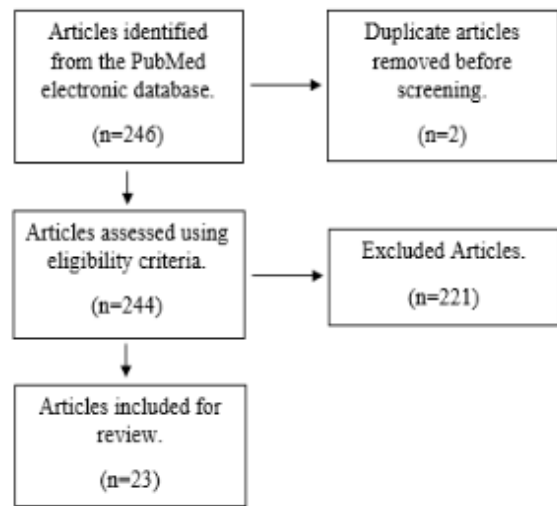


Figure 1: Process for Source Selection

Discussion

Multiple studies indicated that there were notable benefits associated with the implementation of SBNIs on children's nutrition statuses and healthy habit maintenance [2-24]. This review will examine the various intervention components of SBNIs that are associated with changes in children's overall nutrition knowledge, dietary intake, and food consumption behaviours.

Intervention components

Several studies indicated benefits associated with the utilization of multi-component SBNIs, integrating increased nutritional literacy, food provision, health promotion, physical activity, and communal engagement toward support-

ing children's nutritional statuses and overall healthy habit maintenance [2,5-8,17,21-24]. SBNIs solely addressing food provision (increased levels of fruits and vegetables (F/V), dairy products (DP), and Meat and alternatives (M/A)) were not as effective in addressing children's dietary behaviours as multi-component approaches [2-4,16-18,21]. Additionally, multiple studies stated that increased community and family involvement improved SBNI delivery as these relationships can help model optimal behaviours and foster an environment that supports healthy diets [2,4,5].

Additionally, effective intervention implementation requires resource availability, educator supports, and continuous program delivery [2,5,16-21]. Studies that implemented SBNIs with clear guidelines and optimal resources indicated better effects on children's nutritional statuses and healthy habits [2]. Reduced support for education providers resulted in poor intervention outcomes, as educators are strained for time and resources and often limited to their curriculum, making it difficult to uphold additional responsibilities [2,5,9,14]. Furthermore, continual implementation showed increased program compliance and improved information acquisition in children [2,4,11,18,21].

SBNIs also varied in structure. Some used challenges and activities, gardening, and cooking initiatives, while others focused more on curriculum or incorporated community and familial to improve children's dietary behaviours [2-4,13-24]. Successful SBNIs had school environments that (i) promoted wellness through nutritional literacy and preventative measures, (ii) provided engagement opportunities, (iii) addressed children's needs, (iv) increased food accessibility, and (iv) provided strategies for

sustainable healthy habit maintenance [5, 6-18]. Furthermore, practices outlined within SBNIs should be continued in schools and at home after program completion to support healthy habit maintenance [5,14,15].

Children's nutrition knowledge

With SBNI implementation, several studies have indicated positive results associated with children's dietary behaviours and nutrition knowledge [2,5-24]. Providing school-based nutrition education has shown increased nutrition knowledge in children, especially related to food preparation techniques, dietary knowledge, and exercise [2,5,10,13-21]. Additionally, sustainable nutrition knowledge acquisition was heightened with increased autonomy [3].

Dietary behaviour outcomes

Most studies indicated significant impacts associated with children's dietary behaviours with the implementation of SBNIs [2,3,5,6,8-11]. Many studies identified an enhanced willingness in children to explore alternative food options [2,5,8,11,13,19]. Additionally, many children indicated improved eating behaviours and an increased preference for highly nutritious foods [2,3,5-24]. Improved healthy food promotion and food accessibility influenced food likability and food preferences in children [2,5,6,9,18]. Environmental effects are also a key component in children's knowledge acquisition of nutrition and healthy habits [2,8-20]. Several studies emphasized the importance of cultural relevance, using food options that are accessible, tasting sessions, and incorporating diverse preferences toward sustained dietary behaviours [9-22]. Intervention duration is another crucial component of dietary behaviour sustain-

ability [2-4,5,8-24]. SBNI with longer durations indicated greater and more sustainable changes in healthy habit maintenance for children as opposed to shorter interventions [2,8,9,11,16-24].

Food consumption outcomes

One of the main benefits associated with SBNI implementation was the overall increased consumption of nutritious foods among children, with variations between F/V, DP, and M/A [2,3,5,6,8-24]. An increase in daily F/V food availability was associated with improved dietary behaviours and decreases in nutrition deficiencies [2,3,5,6,8-11,16-24]. Some studies indicated that increased F/V consumption was more about increased consumption of fruits, not vegetables, as fruits are seen as a more practical snack; however, the baseline for fruits was also higher [2,3,6,17]. Additionally, several studies indicated decreased consumption of non-nutritional foods (ex., chips, sodas), smaller portions, and reduced dietary fat levels in children as a result of program implementation [5,13-17,20-24].

Limitations

There are several limitations to this literature review. Firstly, while the review examined children between the ages of 5-19, it is noted that intervention adherence may differ between younger and older children, as younger children may misinterpret instructions [3-22]. Secondly, variations in study designs and settings may affect generalizability due to a lack of standardization [4,8,22]. Thirdly, training teachers for SBNI implementation, instead of incorporating skilled experts, may affect study validity as teachers are limited in time, resources, and curricula responsibilities [6,9].

Finally, most studies did not look at long-term effects, making it difficult to assume behavioural maintenance [2,8,9,11,16-24].

Conclusion

Overall, SBNI are quite effective in improving nutrition statuses and healthy habit maintenance in children between the ages of 5-19 years. SBNI that utilized multi-component approaches elicited long-term and continuous implementation efforts, communal engagement, and provided educator support and effective resources indicated the highest amount of positive health outcomes and behaviours in children. [2,5-8,10-24]. Moving forward, global investment is needed to ensure i) that future research interventions investigate the long-term effects of SBNI implementation and ii) that future policies adopt similar strategies that aim to reduce obesity rates and promote healthy livelihoods for all children worldwide.

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