

Factors Influencing Schoolchildren's Obesity: A Qualitative Document Analysis of School-Based Obesity Interventions in Five Countries

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Abstract

Schoolchildren's obesity problem witnessed a dramatic increase around the world. That led to an obese youth generation, threatening their health status and predicting a metabolic disease. This systematic review's research primarily aims to understand how education can help control obesity among school students by conducting a comprehensive literature review of obesity management strategies used in schools over the past five years. The data resources are available through four database sites, including the Buid library, PubMed, Up-ToDate, and scholar sites. We included publications from the last five years, with one study from 2011. The searching system primarily links to the topics of children's obesity, factors that influence it, the role of education, and methods of implementation. The search focused particularly on the interventions taken to prevent obesity in schoolchildren inside or outside the UAE. Limitation: there was difficulty in comparing those studies due to different study methods, strategies in data collection and assessment, and varying implementation processes and theories used to prevent obesity and overweight problems. Summary of findings: Factors that influence obesity are economic, psychological, parents' behavior, eating behavior, and limited physical activity. Through implementing diverse educational theories such as guidance, cognitive, social, and behavioral theories, we can construct multi-skill strategies not only to spread awareness among children but also, in the future, to introduce a special curriculum concerning obesity orientation, prevention, and management.

Keywords

School Obesity Prevention, Influencing Factors, School Intervention, Educational Program, Child Obesity, Policy, Strategy

1. Introduction

1.1. Background

In 1998, the National Institutes of Health (NIH) marked a significant milestone by combating misconceptions about obesity and defining it as a chronic disease. According to statistics, obesity affects approximately 14.4 million children, causing changes in body metabolism, anatomy, and physiology that have a negative impact on the physical and mental health of children and adolescents [1]. Obesity could be defined as a central disease in a cluster of multimorbidities that can modify health outcomes for individuals and lead to a decrease in quality of life [2]. Biopsychosocial factors, somatic risk factors, social networks, the burden of these diseases, and healthcare consumption can all act as modifiers of disease, leading to increased disability.

Many studies have proved that obese children are growing into obese adolescents and adults, which increases the risk of acute or chronic complications such as hypertension, dyslipidemia, fatty liver disease (NAFLD), cardiovascular disease, insulin resistance, and type 2 diabetes. Moreover, obesity leads to consequences such as psychological stress, reduced self-esteem, depression symptoms, and lower academic achievement. Furthermore, obesity at a young age consumes more resources than a healthy person, so the primary prevention and management effort at this stage is crucial [3].

1.2. Definition

The National Center for Chronic Disease Prevention and Health Promotion recently provided this definition [4].

Body mass index BMI is the measurement used to calculate the excess body fatty tissues. The formula used for calculation is body weight in kilograms over the squared height in meters (kg/m^2). In adults, cut-off points for BMI interpretation differ from those used for children and teens, as the interpretation is age- and sex-specific and categorized into three stratifications: healthy weight, overweight, and obese. These categories are tracked using a growth chart with specific percentiles for BMI. That's illustrated in **Table 1** below [4].

Chronic disease is a health condition that requires medical intervention and can reduce an individual's activity, daily life, or both.

Table 1. Classification of BMI percentiles for children and teens of the same age and sex.

Obesity Classification	Definition
Overweight	BMI at or above the 85th percentile and below the 95th percentile
Obesity	BMI at or above the 95th percentile
Severe obesity	$\geq 120\%$ to $< 140\%$ of the 95th percentile) or a BMI $\geq 35 \text{ kg}/\text{m}^2$ to
Class 2 obesity	$< 40 \text{ kg}/\text{m}^2$, whichever is lower based on age and sex.
Class 3 obesity	BMI $\geq 40 \text{ kg}/\text{m}^2$, or 140% of the 95th percentile for age and sex

1.3. Problem

In fact, the UAE is considered one of the leading countries in diabetes progression; in 2018, about 1.4 million people had DM there. And the cost of treatment is approximately \$4.16 billion per year in Sharjah alone [5]. In comparison to Saudi Arabia, the prevalence of diabetes in the UAE is higher, with Saudi Arabia reporting a rate of 27% [6]. Further, obesity is strongly associated with comorbidities like diabetes and its complications, like macrovascular and microvascular complications like heart disease, diabetic retinopathy, and kidney failure [7]. So different health guidelines, such as the American Diabetes Association (ADA) and the International Society for Pediatric and Adolescent Diabetes (ISPAD) guidelines 2022, are calling for early screening of prediabetes and type 2 diabetes in obese or insulin-resistant children [8].

1.4. Purpose

Understanding the multitude of factors that influence the conundrum of obesity is the cornerstone of evolving the handful of tactics for its management and prevention. Those factors include disparities within ethnicities, economics, environment, social background, and cultural preferences [9]. The American Academy of Pediatrics has stated that the modern trend is to use the term “intensive health behavior and lifestyle treatment (IHBLT)” instead of “intensive lifestyle or behavioral modification.” Therefore, this research primarily aims to understand how education can help control obesity among school students by conducting a comprehensive literature review of obesity management through education over the past five years.

1.5. Question

Here is the rose question: What is the best strategy that can be implemented according to age and gender to maximize the effectiveness of the interventions?

1.6. Importance

In 2020, the rate of obesity among adolescents in UAE schools was 34.7%, and the rate was higher at public schools than private schools [10]. And the prevalence of obesity among Abu Dhabi schools was high, at about 19.8%, showing a significant relationship with obese parents and its association with comorbidities such as high blood pressure disease [11]. Furthermore, in the neighboring country, Saudi Arabia, it was found that 13.5% of children were obese and 16.7% were overweight, and the prevalence of obesity was twice that of their peers, especially those who took lunch from the school cafeteria. Children who consumed soft drinks four or more times weekly significantly contributed to the high obesity rate (p-value = 0.005). This figure is due to unhealthy lifestyles resulting from urbanization, and it suggests increasing awareness about obesity and healthy lifestyles among schoolchildren [12]. Further, studies seeking interventions to address overweight and obesity issues at school found that increasing body activity and energy ex-

penditure inside school is a suitable strategy. Generally, the circumstances of parents and the environment can significantly influence students' adoption of behaviors related to physical activity, nutrition knowledge, and personal choices; additionally, the increased use of technology in school education has heightened the risk of weight gain. Research also demonstrated that structural interventions were more effective for male children, while behavioral interventions were more effective for female students [13]. Importantly, the investigation provided clarity regarding the lack of a theoretical basis for supporting educational intervention in different age groups, and the theoretical model of intervention was ignored.

1.7. Rational

The dilemma of obesity among children in school is increasing. To tackle it, we need to encounter enough knowledge about its influencing factors, either from school, family members, or the child itself. We need to explore ways to address this issue through education and identify the most effective theories to bring about change. And how can adopting the changes and implementation at school design prevent the consequences of obesity in the youth phase as well as monitor the continuity of the performance grade by grade? In the literature, solutions are ready and used but not evaluated in the long run, and some educational theories are used. Its effectiveness disappeared after the research timeline due to the discontinuity of use and evaluation.

2. Literature Review

A specific risk factor that is reasonably foreseeable primarily involves the behavior of parents. Schoolteachers and social beliefs also play a significant role in this risk factor. This is supported by a study investigating how 120 Latino fathers of preschool children aged 4 - 5 years influence their children's food choices through education, physical activity, and food adoption within a participatory framework. This approach transitions from personal experiences to practical demonstrations, enhancing understanding of subjective experiences in relation to participatory events and spiritual phenomena. First, the participants will answer a questionnaire to evaluate their knowledge, attitudes, behaviors, and intentions, as well as participate in physical activity monitoring. Then an interview was conducted with the students' parents to provide education and awareness about obesity. Then the experimental learning theory of implementing physical activity was used, and role-taking and role-playing are particularly useful rehearsals of desired prosocial attitudes and behaviors. To ensure a robust understanding of the father's role in his family and prevent obesity, a multidisciplinary team was formed. A grounded theory approach to open coding was used continuously throughout the fieldwork, observing people's behavior. As a result, fathers increased their knowledge and became aware of a healthy lifestyle, and they learned how to engage not only in physical activity, food shopping, and meal preparation with their children but also to take on an active role in the family's overall well-being, leading to healthier

lifestyles among the Latino community. The gap has diverse backgrounds and perspectives that need to be studied in the future [14].

A formative study was conducted in five government schools in Gauteng Province, South Africa, to spread awareness about obesity risk and prevention. The study involved reviewing literature, conducting assessments, setting objectives, and implementing a theory-based program. The intervention aimed to promote physical activity and nutrition while addressing the impact of parents. The social cognitive theory was used to construct self-efficacy and enhance behavioral capability. The intervention was aligned with the existing grade 6 curriculum and the community's needs. The new interventions, named Child Influencing Parental Communication for Life Education (CIRCLE), targeted student parents and the school environment. A process will be conducted to evaluate the program and study malnutrition in the future [15].

Grounded in behavioral suitability theory, obese children are attracted to food through various modalities, including sensory inputs such as vision and smell, peer pressure to share and eat, and genetic factors that contribute to eating disorders. That has been argued in a longitudinal cohort study by Among the 1730 children aged 4 - 5 years old from a health center in Alberta, Canada, for preschool immunization, a professional health care provider was assessing the children's weight and height, and the BMI was categorized according to the Centers for Disease Control and Prevention (CDC) cut-off criteria. Then the parents share in filling out the questionnaire on children's eating behavior (CEBQ). Founded There was A significant association had been established between emotional overeating, food enjoyment, food fussiness, slowness in eating, and eating disorder behavior ($p = 0.01$). The intriguing questionnaire results also found that stress time, putting junk food as a first choice, and busy time prevent families from specifying time for exercise. And the gravest finding was that people started to worry about the quality and quantity of food after getting a metabolic disease or diabetes. Finally, this study faces different limitations; it does not include the cause-and-effect relationship between gaining weight and eating behavior. And the parents' reporting of eating behavior could have a bias because of their perception of showing positive feedback. Therefore, future research is suggested to discover the factors affecting these eating behaviors and the ability to rectify them for weight reduction in children [16].

Another Iraqi school of thought noted that primary school obesity had spread. It should be addressed through legislation, rules, programs, and public health, not clinical treatment. Poses should follow instructions to overcome obesity. This theory encourages creative problem-solving outside of school. Enhancing the individual's understanding of his capabilities and demands in his living environment and tailoring the chosen options to his condition Because it involves individual psychological support that affects decision-making, the guidance process is long-term. To reach an appropriate conclusion, other specialists must provide assistance based on individual needs. The first step in guidance is to fulfill students' parents' needs, and then she implements solutions. Student psychological issues:

Well-being and body issues Personal relationships and leisure time management, Unacceptable phobias, Arrogant and overconfident in public, Emotional, like love and sex failure Economic conditions often lead to maladaptive adjustment. This qualitative study examined guiding activities, their use, and frequency among third- to sixth-grade learners at a primary Stirling School in Erbil, Iraqi Kurdistan. Overweight and obesity are teacher agenda items. The obesity rate was measured on lists, not students, in a semi-structured conversation with teachers. Data is used to calculate obesity rates. The survey found that teachers practice advising twice a week after school. The first teacher suggested discussing morality and communication skills, showing movies, stories, and student presentations, and discussing tea and snacks. The second teacher focused on family, morals, community, effective use of spare time, frugality, charity, visiting parents and home assignments, helping parents solve difficulties, and lectures to improve students in substandard courses. Develop music and art skills. The third instructor helps kids voice their needs and worries, which strengthens student relationships and helps them develop emotionally. No instructor has solved obesity using guidance activities. After asking teachers, 17% of 224 pupils are obese. After the assessment and needs collection, a qualified multidisciplinary team was formed to spread obesity prevention awareness among students. The study revealed that the team has expanded and designed guidance activities to address students' needs since their inception. Future ideas should include putting this topic on the agenda at relevant venues to create public health policy [17].

A new educational approach was developed to measure the impact of a learning module on the eating behavior of 157 children (87 girls and 70 boys) aged 10 to 12 years in sixth grade at a suburban school in Porto's metropolitan area, Portugal, over one school year. Parents were invited to share in the longitudinal study. Thereafter, the school's health infrastructure was evaluated, from the cafeteria to the curriculum, physical activity during school, and health prevention methods. Then, the intervention step of the PHS-pro was prepared based on the theoretical model to stimulate a change in the student's eating behavior. It consisted of eight learning modules that followed five stages in the program to shift students from inaction to action status. And monitoring of eating habits was observed via food recall progress for 3 days weekly. The intervention is based on the World Health Organization guidelines for children's health recommendations, which include that children should have five adequate portions of fruits and vegetables, zero sugar drinks, one hour of physical activity daily, 8 - 10 hours of sleep, and not more than two hours of screen watching daily. The learning modules target the barriers, enhance problem-solving for individualized needs, and demonstrate how to implement the solution on a daily basis. The method of measurement was the three-day food record before and after starting the program and seven times after each module. And the results showed a significant increase in fruit and vegetable portions per day; soft drinks were reduced significantly. And it's expected that if the program continues over time, it will have a positive effect on children's health

and prevent or reduce obesity [18].

3. Methodology

3.1. Search Strategy and Data Sources

A descriptive literature review was performed to locate papers and publications that talk about school-based factors that affect obesity and ways to stop kids from being overweight or obese. The search was done between October 26, 2023, and November 13, 2023, in four key databases: the British University in Dubai (BUiD) Library database, PubMed, UpToDate, and Google Scholar.

The following search strings were used with Boolean operators:

("childhood obesity" OR "school obesity prevention") AND ("influencing factors" OR "determinants")

("school intervention" OR "educational program") AND ("physical activity" OR "nutrition")

("child obesity" AND "policy" OR "guideline" OR "strategy")

The searches were only for English-language publications during the past five years (2018-2023). We also incorporated an earlier study from 2011 that was important to the research issue. We also looked for policy documents and directives on the official websites of the Ministry of Education and the Ministry of Health, in addition to searching databases.

3.2. Criteria for Selection

Inclusion criteria: Studies/documents concerning schoolchildren (ages 2 - 18 years); detailing BMI, obesity prevalence, or obesity causation; emphasizing educational or school-based preventive interventions (rather than treatments); and offering international or national guidelines/recommendations for obesity prevention.

Exclusion criteria: Studies concentrating on medical or clinical etiologies of obesity (e.g., Prader-Willi syndrome, hormonal disorders, steroid-induced obesity), non-educational environments, or documents not accessible in English.

3.3. Data Extraction and Examination

Two scientists separately conducted data extraction. We read the full documents closely and coded the results based on the activities conducted, the intervention tactics, the theoretical frameworks, and the gaps that were found. The investigation focused on comparing different countries' ways of dealing with obesity in schools.

3.4. Process of Screening

Through searches of databases and websites, 12 records were found. After screening, 7 records were eliminated for failing to discuss educational interventions or solutions. Five full-text papers were evaluated for eligibility, and all five satisfied the inclusion requirements, therefore being incorporated into the qualitative document analysis (Villar *et al.*, 2023 [14], Arthur *et al.*, 2020 [15], Spence *et al.*, 2011

[16], Bilgin & Yildiz, 2022 [17], Vieira & Carvalho, 2021 [18]).

Diagram of the PRISMA Flow

We included a PRISMA-style flow diagram in **Figure 1** to show the processes of the document selection: identification, screening, eligibility, and inclusion.

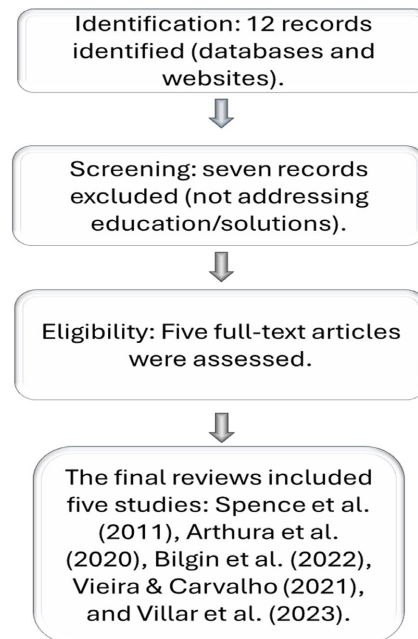


Figure 1. Process of document selection.

3.5. Evaluation of Quality

To evaluate methodological quality and bias risk, each of the five papers included was assessed using the CASP (Critical Appraisal Skills Program) checklist for qualitative investigations [19]. The assessment determined whether the research had a clear objective, an appropriate design, adequate recruitment, reliable data collection methods, thorough analysis, ethical considerations, and a clear presentation of results. Two reviewers independently conducted the appraisal, resolving any disputes through discussion. The quality appraisal of the selected study is illustrated in **Table 2** below.

Table 2. Quality appraisal of included studies.

Study (Author, Year)	Clear Aims	Appropriate Method	Recruitment	Data Collection	Analysis Rigor	Ethical Issues Addressed	Overall Risk of Bias
Spence <i>et al.</i> , 2011	Yes	Yes	Partial	Yes	Partial	Yes	Moderate
Arthura <i>et al.</i> , 2020	Yes	Yes	Yes	Yes	Yes	Yes	Low
Bilgin <i>et al.</i> , 2022	Yes	Yes	Yes	Partial	Partial	Yes	Moderate
Vieira & Carvalho, 2021	Yes	Yes	Yes	Yes	Yes	Yes	Low
Villar <i>et al.</i> , 2023	Yes	Yes	Yes	Yes	Yes	Yes	Low

4. Results and Analysis

Five relevant evidence-based studies remained for analysis after seven of the original 12 records were eliminated for lack of educational solutions (Villar *et al.*, 2023 [14], Arthur *et al.*, 2020 [15], Spence *et al.*, 2011 [16], Bilgin & Yildiz, 2022 [17], Vieira & Carvalho, 2021 [18]). Collectively, these studies show how educational interventions can effectively support school-aged children's prevention of obesity when they are adapted to their developmental stage and gender. Children in pre-school (ages 4 - 5). At this point, family-centered and sensory-based approaches are important, according to Villar *et al.*, 2023 [14] and Spence *et al.*, 2011 [16]. According to Villar *et al.*, 2023 [14], Preschoolers' eating habits were considerably enhanced when Latino fathers were involved in culturally competent, hands-on learning. Similarly, Spence *et al.* discovered that peer pressure and sensory cues influenced young children's eating habits, indicating the importance of structured peer interaction and early parental modeling.

Pre-adolescents are defined as individuals between the ages of 10 and 12. Arthur *et al.*, 2020 [15] and Vieira & Carvalho, 2021 [18] highlighted strategies that combine school-based modules with parental involvement. Arthur *et al.*, 2020 [15] study from South Africa demonstrated that family-wide health behavior was enhanced when students received direct instruction supported by parental guidance. According to a Portuguese study by Vieira & Carvalho, 2021 [18] structured modules that followed WHO guidelines successfully converted inactive students into active ones, especially when incorporated into daily routines and school policies. Students in the middle grade (ages 8 - 12). Psychological guidance activities that addressed self-regulation and motivation were shown to be effective in lowering risk factors for obesity by [16] (Spence *et al.*, 2011). Crucially, their results implied that laws instituting such recommendations might offer long-term, sustainable advantages that go beyond short-term weight reduction.

Findings that are specific to gender. Subtle gender differences were observed across studies. For instance, Arthur *et al.*, 2020 [15] found that boys responded better to competitive or skill-based activities, whereas girls benefited more from supportive, confidence-building interventions that reinforced body image and wellness [16] (Spence *et al.*, 2011). Vieira & Carvalho (2021) [18] also demonstrated that when exposed to structured modules, both boys and girls increased their activity levels; however, engagement was higher when interventions focused on gender-specific motivations.

Based on the results of this study, the most effective teaching methods are identified as follows:

Age-sensitive: self-regulation and structured modules for pre-adolescents, and play and family-based activities for younger children.

Gender-responsive: competitive, team-oriented activities for boys; encouraging, self-assurance-boosting methods for girls.

Policy-anchored: when interventions are incorporated into curricula, school regulations, and more general health policies, long-term sustainability is attained.

5. Discussion

Recent systematic reviews have reinforced and expanded the patterns noted in our study. For example, [20] analyzed 53 RCTs globally and found that while physical activity-only interventions are particularly effective for reducing BMI among children, multiple-component interventions (combining physical activity, nutrition/education, and school policy) produce greater improvements in BMI z-scores. Similarly, [21] emphasized that longer-duration, intensive, multi-component programs tend to yield stronger outcomes, especially in settings where school resources support curriculum integration of both education and behavior change. Additionally, [22] showed that combining dietary changes with physical activity, as well as standalone behavioral interventions, significantly reduced central obesity (e.g., waist circumference) among children aged 5 - 18 years. For younger children (preschool age), [23] showed that early, parent-involved, developmentally tailored educational interventions can meaningfully reduce obesity risk. These findings align with our synthesis that age-sensitive strategies (play/experiential for younger children; structured education + behavior change for older children) and gender-responsive approaches are among the most promising. Incorporating such findings illustrates the value of multi-component interventions that are sensitive to age and gender in designing school-based obesity prevention programs.

The study highlights the importance of schools as a platform for children's obesity management, as 90% of young people are registered for education and spend one-third of their day there. Research on academic performance and healthy behavior adoption is crucial [24]. Prior to any step, we have to understand barriers that could hinder the process of healthy program implementation, for instance, a lack of resources such as specialist teachers in physical activity and nutrition, food presentation, and adequate knowledge of health promotion [25]. As well as the need to understand the conditions that exacerbate the situation, such as healthy behaviors such as sleeping time and late supper, exercise, and meal discipline patterns [26]. Those factors are taken into consideration in the included studies, highlighting the importance of parents because they are role models for their children's behavior. Conventionally, values, knowledge, and beliefs are transferred from parents to siblings. The educational theories program aims to spread health promotion across generations, with parents playing a crucial role in promoting health. Engaging parents in both school and home environments is essential to overcome obesity challenges. The recruiting logic model design helps organize problem-solving strategies, while social cognitive theory is crucial for self-efficacy construction and behavioral action. Guidance is essential for students to form new knowledge and find solutions, extending beyond the school setting.

6. Conclusion

On the whole, there was agreement that obesity is the modern dilemma among schoolchildren, and it's in increasing. That we need to focus on it as a disease, which leads to dramatic health harm and high costs of treatment if we do not

recognize the influencing factors and manage it. Although education can play a crucial role in combating overweight and obesity within school institutions, it is deemed confined and not used effectively. Therefore, through implementing diverse educational theories such as guidance, cognitive, social, and behavioral theories, we can construct multi-skill strategies not only to spread awareness among children but also, in the future, to introduce a special curriculum concerning obesity orientation, prevention, and management, starting from five years old up to secondary school. Rich with personal maps and measurement interventions and continuous follow-up in a regular periodic time.

7. Recommendation

7.1. Curriculum Modification

The experiences of Portugal and South Africa are contrasted to show how curriculum design can be adjusted for context and age. According to Vieira & Carvalho, 2021 [18] structured WHO-aligned health modules in Portugal successfully raised activity levels in children aged 10 to 12, with boys participating more in skill-based instruction. In contrast, Arthur *et al.*, 2020 [15] focused on nutrition modules, role-playing, and experiential learning for pre-adolescents in South Africa, where parents and kids showed healthier habits. These studies collectively indicate that curriculum changes are most successful when they are context-sensitive (adapted to cultural and community needs) and age-appropriate (structured modules for older children; experiential play for younger/pre-adolescents).

7.2. BMI Tracking and Input

Although in different ways, Spence *et al.*, 2011 [16] and Bilgin & Yildiz 2022 [17] both emphasize the importance of monitoring. The significance of early measurement and awareness was highlighted by Spence's large Canadian cohort (n = 1730, ages 4 - 5), which showed a strong correlation between BMI patterns and children's eating habits and peer pressure. Bilgin's work with Iraqi students in grades 3 - 6 demonstrated that long-term lifestyle changes were motivated by guidance activities in conjunction with feedback on health status. When combined, these results indicate that BMI monitoring is beneficial for all age groups, but its effectiveness is enhanced when combined with educational support and feedback.

7.3. Involvement of Parents and Caregivers

Parental involvement increases outcomes, but through different mechanisms, as shown by Villar *et al.*, 2023 [14] in the USA and Arthur *et al.*, 2020 [15] in South Africa. Preschoolers' eating habits were enhanced by culturally sensitive experiential learning and participatory curriculum design, according to Villar's study with Latino fathers. In contrast, Arthur's program demonstrated that teaching parents alongside pre-adolescent students led to a change in behavior across the entire family. Whether it is through empowering fathers in preschool settings or integrating families into school-based programs for older children, these findings

collectively imply that parental engagement is a consistent success factor across contexts.

8. Limitation

There was difficulty in comparing those studies due to different study methods, strategies in data collection and assessment, and varying implementation processes and theories used to prevent and solve obesity and overweight problem. Moreover, there were no long-term evaluations for obesity prevention after the studies were conducted.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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