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## ORIGINAL RESEARCH

# School-based intervention to promote healthy nutrition and physical activity in Palestinian girls - Process evaluation

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## Abstract

**Aim:** School-based interventions have the potential to intervene with the students and teachers, and to reach their families. A controlled program trial was designed to promote healthy eating and physical activity among Palestinian females, while the process evaluation aimed to monitor the program's implementation and identify factors that led to its success.

**Methods:** A randomized controlled program trial was conducted in 14-Palestinian schools under 4-different jurisdictions, divided into 7-control and 7-intervention schools chosen randomly after applying a sample size calculation. A monitoring system, elucidated factors which contributed to improved outcomes, was applied in the intervention schools only, while the control schools continued with their regular curriculum. The process evaluation tracked the timing and implementation of interventions including changes in the school strategy, policy and structure, teachers' capacity building, mothers' education and involvement, the school's supportive health environment, and integration food consumption records and physical activity into the daily class routine.

**Results:** The intervention included 3,805 schoolchildren and their mothers' as-well-as 147 teachers. At the completion of the 18-month intervention the schools had successfully participated in the various intervention activities. Only the private school did not sustain some of the interventions, which put it at 55% completion of the school supportive environment activities compared to the other schools which all reached the 100% completion of planned activities.

**Conclusion:** This process evaluation approach enabled a more comprehensive understanding of the intervention implementation and outcomes and identified factors that contribute to the sustainability of the intervention. Each school required a different amount of time for understanding, applying and implementing the program depending on its needs.

**Keywords:** *intervention, nutrition, physical activity, process evaluation, school, schoolchildren.*

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**Conflicts of interest:** None declared.

## Introduction

Obesity is a significant risk factor for chronic diseases, including type II diabetes mellitus, coronary heart disease, hypertension, stroke and certain types of cancer (1-3). The prevalence of obesity in children and adolescents is increasing throughout the world (1). In Palestine, there is a lack of a nationally representative survey that reveals the prevalence rates of overweight/obesity and physical activity among all age groups. A cross sectional study conducted in 2017 in Palestine showed that the prevalence of overweight and obesity was 14.5 and 15.7% respectively among Palestinian children between the ages of 6-12 years (2). While 15.1% of the female were overweight and 13.8% were obese. Another systematic review showed that the prevalence of overweight and obesity in adults was 30% and 18% respectively (1).

In East Jerusalem, rapid urbanization, modernization, and sedentary lifestyles have contributed to the growing frequency of overweight and obesity in all age groups (3). The need for effective preventive and protective measures to control the obesity epidemic has become a major focus of attention. Evidence suggests that increased childhood body mass index (BMI) can predict adulthood overweight and obesity (4) indicating that these interventions should be introduced as early as possible so that people employ a healthy lifestyle from childhood.

Healthy nutrition and physical activity are the key factors in preventing and reducing obesity in children (5). Programs aimed at promoting healthy nutrition and physical activity may be best addressed in a school setting, as schools offer a safe and supportive environment where children can learn and implement these healthy practices (6,7).

Several published studies on weight management interventions in the school

setting show promising results (8), but there is a lack of process evaluation data to assist investigators in designing optimal studies. Process evaluation can illuminate how the intervention was implemented, participants' level of engagement, and the level of maintenance during the intervention (9). Process evaluation is crucial in providing a better understanding of the different factors influencing the implementation process (10). Analysis of process data may clarify the causal mechanisms that lead to outcomes. Process evaluation informs subsequent interventions, enabling replication in other settings (9).

This paper describes a process evaluation of a school-based randomized controlled program trial that took place over two academic years in each school. The intervention was implemented in seven girls' elementary schools in East Jerusalem, with seven additional schools serving as a control group. The aim of this intervention was to promote healthy eating and physical activity among the schoolchildren, their mothers and teachers. The process evaluation aimed to monitor the program's implementation and to elucidate which factors improved the outcomes.

## Methods

The study design and objectives have been described elsewhere in detail (11). Briefly, the intervention aimed to improve knowledge, attitudes and health behaviors of schoolchildren, their teachers and their mothers with regard to healthy nutrition (12) and physical activity. The sample size calculation, described in detail elsewhere (11), was based on the estimated prevalence of healthy behaviors relating to physical activity (>5 days per week), which was estimated at 25% among girls in grade 6 in the Heath Behavior School Children study

(13). Fourteen girls' schools operating in East Jerusalem under differing jurisdictions: (Jerusalem Municipality (JM), Palestinian Authority (PA), United Nations Relief and Works Agency (UNRWA), and private schools) were stratified by jurisdiction and then randomized into 7 intervention and 7 control schools. The pre- and post-intervention data for the outcome evaluation was collected from one 4<sup>th</sup> grade class and one 5<sup>th</sup> grade class in each of the schools; however, the intervention activities and monitoring were implemented within all the intervention schools' body including all schoolchildren in all different grades, while control schools continued with regular curriculum.

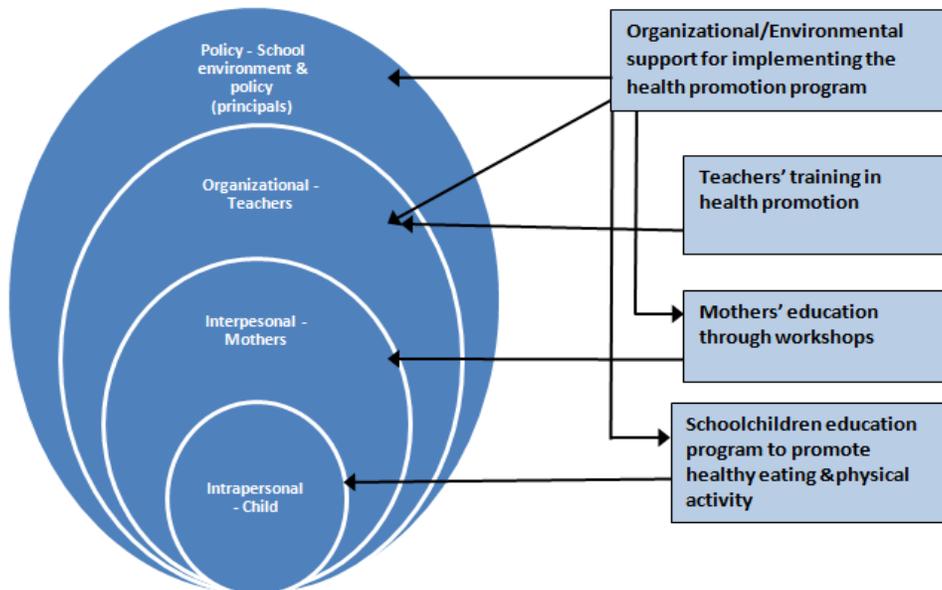
The study procedures were approved by the Hebrew University of Jerusalem/Authority for Research Students Committee, as well as the Israeli Ministry of Education, Palestinian Ministry of Education, UNRWA Office of

Education Department and the private schools' principals.

**Intervention development and delivery**

The intervention was designed and implemented through the utilization of the socio-ecological model (Figure 1) to promote healthy eating and physical activity in the intervention schools, whereas the control schools continued with their regular curriculum. The program was designed and implemented as a multi-level intervention, targeting schoolchildren, their mothers, and their teachers, as well as addressing school policies and the physical and social environments. The intervention included numerous components related to healthy eating and physical activity, and encompassed the entire school setting. The program had the support and commitment of the school principals.

**Figure 1. Ecological Model**



*Intervention strategy and structure:* In each school, a teacher was appointed as the program coordinator and headed the health steering committee. The health steering committee consisted of representatives of teachers, mothers, schoolchildren, and the owner of the canteen (8-10 individuals).

*Teachers' capacity building:* Teachers were trained through five training sessions of 120-150 minutes long given in the setting of in-service training for professional credit.

*Mothers' education and involvement:* Mothers were represented on the health steering committee and were invited to seven workshops held in each of the schools (120-150 minutes long each), focusing on the importance of healthy eating (Mediterranean diet pattern) and physical activity.

*Supportive health environment and policy:* The components of the program were developed by the school team in cooperation with the researcher. Intervention activities are presented in Table 2. Successful and creative components that were suggested by school health steering committees were then disseminated to other schools as possible interventions. Schools ended up implementing activities that included:

- a.** changing the school canteen offerings to exclusively healthier food choices (no sugared drinks, candy, or chips, and more fresh juices, fruit, and vegetables);
- b.** integrating health messages into the morning announcements (the importance of healthy food and regular exercise);
- c.** a healthy wall magazine displayed in each class twice a year, created by the students under the supervision of their teacher;
- d.** a healthy corner in each classroom;
- e.** decorating the hallways with paintings encouraging healthy nutrition;

interviews (teachers, schoolchildren and their mothers) to monitor the intervention

**f.** decorating the play yards with games such as "snakes and ladders," "tic tac toe," and "hopscotch" to promote physical activity during breaks;

**g.** morning aerobics supervised by the physical education teacher;

**h.** health promotion checklist in each class to track schoolchildren's daily healthy habits of eating breakfast, drinking milk, and bringing healthy lunches (i.e. sandwiches, fruit, and vegetables). After a few months, a number of other activities were added, such as an active break (with directed physical activity during the break.);

**i.** alternative rewards.

*Integrating food consumption records in the daily class routine:* in addition to the health promotion checklists, a reward system was designed to encourage the children to opt for healthy food choices: students were incentivized with prizes such as healthy snacks or school stationery, instead of with candies or other unhealthy products, to emphasize the importance of staying healthy.

### **Process Evaluation**

The process evaluation included using a checklist to monitor and document the implementation of the planned activities in the intervention schools, and an assessment of whether the intervention was proceeding as designed. The researcher visited the intervention schools on a bi-weekly basis to directly observe classrooms (decoration, healthy corner, class wall magazine, checklists and active break), hallways (decorations), canteens (products sold) and school yards (decorations and games). The health steering committee met every 4-6 weeks to discuss the current activities and the need for any changes or additions. These meetings were followed by semi-structured activities, progress and the schools' performance.



In addition to the researcher's regular observation visits to the schools throughout the 18 months of the program, specific program evaluation visits were conducted during February–April of the second year of the program, which included the post-intervention questionnaire for the schoolchildren, mothers, and teachers, and interviews with the principals. These visits ensured that the activities were going according to plan and included periodic interviews with mothers and teachers regarding the program as a whole as well as their satisfaction with specific activities.

In order to further explore the components leading to success in the intervention, at the end of the program, the researcher did face-to-face interviews with principals, health steering committee members, and mothers from the more successful intervention schools.

## **Results**

The total number of intervention participants was 3,805 schoolchildren and their mothers as well as 147 teachers in 7 different schools of the intervention. The timeline summarizing the implementation of the intervention is presented in Table 1. The school principal designated one teacher as

program coordinator, who was responsible for implementing and running the program at her school with the help of a health steering committee. The principal also nominated a health steering committee whose members represented teachers, mothers, schoolchildren, and the owner of the canteen (8-10 persons). The researcher met with the committee once every four-six weeks. During the first meeting, the results of each school's baseline study were presented and compared with the data from all fourteen schools, serving as a basis for discussing the program elements. Based on this data, the committee outlined objectives to meet their needs, then designed and implemented the intervention using their own resource.

The program activities were then assigned to members of the teaching staff who were trained as part of the teachers' capacity building (see below). For example, the art teacher was responsible for health promotion hallway decoration, the physical education teacher was assigned to leading morning aerobics, and the homeroom teacher oversaw the school's health magazine and the health promotion checklist (details in Table 2). These activities were monitored by the health steering committee.

**Table 1. Program process evaluation timetable-school monthly performance**

| Intervention Phase                          | 2011  |       |     |      |      |        |           |         |          |          |         |          | 2012  |       |     |      |      | 2013   |           |         |          |          |         |          |       |       |
|---------------------------------------------|-------|-------|-----|------|------|--------|-----------|---------|----------|----------|---------|----------|-------|-------|-----|------|------|--------|-----------|---------|----------|----------|---------|----------|-------|-------|
|                                             | March | April | May | June | July | August | September | October | November | December | January | February | March | April | May | June | July | August | September | October | November | December | January | February | March | April |
| <b>School Strategies and Structure</b>      |       |       |     |      |      |        |           |         |          |          |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Programme coordinator                       |       |       |     |      |      |        | 7         |         |          |          |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Programme development & presentation        |       |       |     |      |      |        |           | 4       | 3        |          |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Formulating health steering committee       |       |       |     |      |      |        |           | 7       |          |          |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Steering committee meeting                  |       |       |     |      |      |        |           | 4       | 3        |          |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| <b>Teachers' Capacity Building (Train)</b>  |       |       |     |      |      |        |           |         |          |          |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Healthy eating                              |       |       |     |      |      | 2      | 2         | 3       |          |          |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Physical education & it's importance        |       |       |     |      |      | 2      | 2         | 3       |          |          |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| How to build a health programme             |       |       |     |      |      | 2      | 2         | 3       |          |          |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| How to apply an active break                |       |       |     |      |      |        |           |         |          |          |         |          | 7     |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Integrate healthy eating & physical acti    |       |       |     |      |      |        |           |         |          |          |         |          | 7     |       |     |      |      |        |           |         |          |          |         |          |       |       |
| <b>Mothers' Education &amp; Involvement</b> |       |       |     |      |      |        |           |         |          |          |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Mothers workshop in Nutrition               |       |       |     |      |      |        |           | 3       | 4        |          |         |          | 3     | 4     |     |      |      |        |           |         |          |          |         | 5        | 4     | 5     |
| Mothers workshop in Physical Activity       |       |       |     |      |      |        |           |         |          |          |         |          | 4     | 3     |     |      |      |        |           |         |          |          |         | 5        | 4     | 5     |
| Participation in schools' health activity   |       |       |     |      |      |        |           |         |          |          |         |          | 2     | 3     | 2   |      |      |        |           |         |          |          |         |          |       | 7     |
| <b>School Supportive Environment</b>        |       |       |     |      |      |        |           |         |          |          |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Clown                                       |       |       |     |      |      |        |           |         | 4        | 3        |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| School morning announcement                 |       |       |     |      |      |        |           |         | 7        |          |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Morning sport                               |       |       |     |      |      |        |           |         |          |          | 7       | 6        |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Student promoting checklist                 |       |       |     |      |      |        |           |         |          | 4        | 6       | 7        |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Health education in classes                 |       |       |     |      |      |        |           |         |          |          |         | 6        |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Changing food products in canteen           |       |       |     |      |      |        |           |         |          | 6        |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Wall health magazine                        |       |       |     |      |      |        |           |         |          | 7        |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Healthy corner in each class                |       |       |     |      |      |        |           |         |          |          | 7       |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Decorating hallways                         |       |       |     |      |      |        |           |         |          |          | 7       |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| Active break                                |       |       |     |      |      |        |           |         |          |          |         | 7        |       |       |     |      |      |        |           |         |          |          |         |          |       |       |
| School yard games                           |       |       |     |      |      |        |           |         |          |          |         |          | 3     | 2     |     |      |      |        |           |         |          |          |         |          |       |       |
| <b>Programme Evaluation</b>                 |       |       |     |      |      |        |           |         |          |          |         |          |       |       |     |      |      |        |           |         |          |          |         |          |       |       |

\*Numbers in the table refer to schools that implemented the activity

**Table 2. Intervention activities**

| Components of the Socio-ecological model | Steps of the Intervention | Procedures                                                                                                                                                                                                                                                        | Providers      |
|------------------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Schoolchildren (n=3,805)                 | Morning Announcements     | The teacher in charge prepared a monthly list of topics related to health issues to be discussed during the morning announcements. A group of schoolchildren were assigned to a certain topic and directed to prepare to present it in a fun and informative way. | Schoolchildren |

|                                     |                                                  |                                                                                                                                                                                                                                                                                                                                                                     |                                                   |
|-------------------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
|                                     |                                                  | The teacher went through the information to certify what would be presented.                                                                                                                                                                                                                                                                                        |                                                   |
|                                     | Morning Aerobics                                 | Every morning schoolchildren would participate in a physical activity such as aerobics, Zumba, dancing, etc. before entering the classroom.                                                                                                                                                                                                                         | Physical education teacher                        |
|                                     | Health Behavior Checklist/ Health Promotion Card | A checklist to show schoolchildren healthy habits such as eating breakfast, drinking milk, and bringing a sandwich, water, and fruits and vegetables to school.<br>Different formats of a health promoting checklist were designed in each class to track schoolchildren's daily healthy habits.<br>Schoolchildren were rewarded with healthy snacks or stationery. | Homeroom teacher                                  |
| Mothers (n=3,805)                   | Mothers' Workshops                               | 4 training sessions (120-150 minutes long each) <ul style="list-style-type: none"> <li>• Healthy eating</li> <li>• Physical activity</li> </ul>                                                                                                                                                                                                                     | Dietitian<br>Physical Educator                    |
|                                     | Schools Activities                               | School Health Day                                                                                                                                                                                                                                                                                                                                                   | School Staff                                      |
| Teachers (n=147)                    | Teachers' Training                               | 5 training sessions (120-150 minutes long each) <ul style="list-style-type: none"> <li>• Healthy eating</li> <li>• Physical activity</li> <li>• Strategies for building school health programs and methods to integrate health into subjects being taught</li> </ul>                                                                                                | Dietitian<br>Physical Educator<br>Health Promoter |
| School's policy & Environment (n=7) | Active Break                                     | Schoolchildren started to eat their sandwiches in class before the 10 o'clock break so they could subsequently go outside for active playtime.                                                                                                                                                                                                                      | Teachers                                          |
|                                     | Decorations                                      | The hallways and the walls of the schools play yards were decorated with paintings of water, fruit and vegetables.                                                                                                                                                                                                                                                  | Teachers and Schoolchildren                       |
|                                     | School Yard Games                                | School play yards were decorated with games such as snakes and ladders, tic tac toe, and hopscotch to promote physical activity during breaks.                                                                                                                                                                                                                      | Teachers                                          |

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                        |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| Wall Magazine                                | A wall magazine was created in each classroom twice every year. It included information on healthy habits, physical activity and specific foods with information about health benefits or harm.                                                                                                                                                                                                                                             | Schoolchildren with the homeroom teacher               |
| Health Education and Healthy Corner in Class | Teachers integrated health topics into the subjects they taught after receiving training in this field, and established a healthy corner with the help of the schoolchildren. Material included three dimensional shapes for healthy food products, the food pyramid, etc.                                                                                                                                                                  | Teachers                                               |
| Healthy food choices in the Canteen          | The owner of the canteen was part of the health steering committee and was included in all steps of the intervention. School canteens were given a transition period to change their food products to include healthier food choices and limit unhealthy food choices. The canteens stopped selling unhealthy snacks (sugared drinks, candy, chips, etc.) and started selling healthy fresh juices, lupin beans, fruit and vegetables, etc. | Owner of the canteen and the health steering committee |

The teachers' capacity building training sessions were held separately in each of the schools. The training targeted 1st–6th grade teachers, 80% of whom received training on the principles and importance of healthy nutrition and physical activity, as well as methods for incorporating this content into class curricula. Teachers were also trained in the principles and strategies of building a school health program. The majority of the training sessions for teachers were attended by the school principal and/or the vice-principal.

During the same period mothers' workshops on importance of healthy nutrition and physical activity were conducted in each of the schools, followed by the opening day kick-off with a clown who presented the main

messages of the program to the schoolchildren in a fun and interactive way. Together with their children, mothers also participated in a field day physical activity program as well as several other activities devoted to healthy eating campaigns. Mothers were also involved in preparing healthy lunches.

Toward the end of the first school term, all seven schools implemented the morning announcements and the healthy wall magazines. They also began changing the products sold at the canteen, except for the private school which did not apply this intervention (since their canteen was a private business and not owned by the school). Health promotion checklists were initiated in each of the classes, monitoring the

schoolchildren's healthy behaviors such as eating breakfast daily, drinking milk before arriving to school, bringing fruit and vegetables to school as snacks, etc.

The morning aerobics were introduced in all seven schools at the beginning of the second term; however, the private school did not continue this component. The seven schools also decorated their hallways and created the healthy corner in every class. They began discussing health during the weekly homeroom period. The private school did not implement this activity as well.

Soon after, teachers in all seven schools were trained on how to introduce an active break and began implementation. This intervention distinguished between a recess designed for eating, supervised by teachers in the classroom, and an outdoor recess in the play yard. This encouraged the students to eat a healthy mid-morning snack and to use their time in the play yard for exercise. Prior to this intervention, students were given one long break in the play yard, during which they were expected to both eat and play at their discretion. Teachers received their final training session on integrating physical activity and healthy eating into the subjects they taught, toward the end of the academic year.

Mothers' activities continued during this period. They received additional workshops on nutrition, followed by physical activity, reaching a total of four mothers' workshops during the academic year in each of the schools. Finally, the mothers participated in the school's health activities, such as the open health day.

School environment was addressed by the beginning of the second academic year of the program; all the schools except for the private school had decorated their schoolyards.

At the completion of the 18 months' intervention, the PA, JM, UNRWA and

private schools had successfully participated in the various intervention activities, including the school strategies and structure, the teachers' trainings, and mothers' workshops. However, when it came to implementing the school supportive environment, the private school did not sustain the morning announcements or decorate the hallways. They also did not decorate the school yard with games, or take part in changing the food products at the canteen. This put the private school at 55% completion of the school supportive environment activities while the other schools all reached the 100% completion.

### *Learning from success*

As mentioned earlier, interviews were conducted at the end of the intervention as part of the process evaluation in order to learn from the most successful school's practices. The following insights were obtained:

#### *Interviews with the School Principals:*

- a. School principals reported that their full support and commitment as well as the teachers' support were of great impact to the success of the program.
- b. They also reported that parents played a crucial role in supporting the programs' activities. Parents helped decorate the hallways, covered the costs of printing the healthy messages, and participated in the workshops and open health days at the schools.
- c. School principals reported that the schoolchildren were eager to play a main role in the program. As such, they were motivated to compete to get more points on the checklist, or to be chosen to give the morning announcements.

- d. According to the school principals, the program had a considerable overall impact on the school environment, the schoolchildren, and their lives inside and outside of school.

*Interviews with the Health Steering Committee:*

- a. According to the health steering committee, the school principals' full support, commitment and provision of the needed equipment was paramount.
- b. The health steering committee also reported that team spirit among teachers was a crucial factor to the program's success.
- c. Finally, the health steering committee noted that the physical education and science teachers were particularly active on the school health steering committee and played a main role in implementing the program.

*Interviews with the Mothers:*

- a. The mothers were convinced of the health benefits and the program's positive impact on them, their daughters and whole family; as such, they were fully supportive of the program and showed increased interest in ensuring that their children consumed healthy food.
- b. The mothers felt involved in the program's activities and were committed to implementing their new knowledge with their families and in their homes.
- c. The mothers ate breakfast daily with their children, especially once their daughters began requesting this.
- d. Educating the mothers on the topic of nutrition, and on the impact of healthy

nutrition on decreasing overweight and obesity, further improved their implementation.

**Discussion**

During this 18-month randomized controlled trial of a school-based health promotion intervention, the process evaluation which monitored implementation was essential for understanding how the program worked, whether it had worked as planned, and identifying the challenges and achievements associated with implementation.

Building school capacity for implementing a sustainable health promotion program is known to be a long-term process (13,14). The process evaluation during the program helped the staff appreciate that each school needed a different time frame for understanding, applying, and implementing the program. Environmental interventions presented one of the challenges, as decorating the hallways and yards—one of the program activities—could not take place at the PA schools before the second year as the schools were undergoing renovations at the end of the first school year. The private schools chose not to implement many of the environmental aspects of the program. As these schools are private businesses, there may have been economic factors that entered into the decision.

It is important to note that several of the schools had already been made aware of the aspects of the health promotion program through municipality programs designed to encourage "health promoting schools." There were training sessions available for individual teachers through standard in-service training; however, these training activities did not provide the specific tools necessary for designing, creating and building a program.

As the program progressed, the school health steering committee implemented its roles and duties more effectively by creating and instituting additional health activities after each meeting, which took place every 4–6 weeks. According to the literature, the sustainability of an intervention program depends greatly on the school health committee's role in planning and implementing the program (15,16). The incorporation of physical education and science teachers as part of the health steering committee was identified as a positive influence, as they both understood the material and were able to incorporate the program's activities in their classes. Differences have been reported in teachers' ability to apply health education programs successfully (18), and science and physical education teachers in particular have been found to be most effective in teaching health related topics (19).

Through our study, we were able to observe that when the schoolchildren began eating in class as part of the “Active Break” intervention, they were directly encouraged by their teachers to consume healthier food products and to decrease their intake of less healthy foods such as salty snacks, chocolates, and sweetened juices (20). Teachers also began eating foods both in school and at home that were healthier, consuming breakfast and more fruits and vegetables in order to be positive role models for their schoolchildren. As part of our program, schoolchildren detailed their health habits according to the health promotion checklist, which included eating breakfast at home, drinking milk, and bringing a sandwich, water, and fruits and vegetables to school. In the process of rewarding their students, teachers themselves became more directed toward healthy practices.

Teacher training played a crucial role in the intervention program's success, as seen in other studies (16,21). The provision of training to guide teachers in incorporating health information into their teaching, as well as offering specific guidance in planning interventions was perceived as an important factor. In this study, 80% of the teachers received training. This represents a better coverage than the 50% of the teachers who received training in a program instituted in Hong Kong (22). Also, our intervention study aimed to train the largest possible number of targeted teachers, whereas the Hong Kong study aimed to train at least one teacher in each school (23).

In the second semester, additional training was encouraged by the administration and the principals at all of the schools, and was attended by all the teachers. Here too, the private school was the exception, with very low participation in training by the teachers at this school. A systematic review showed that in 30 interventions which included training for teachers, 25 of the interventions showed statistically significant results in improving fundamental movement skills and physical activity among the schoolchildren (24). An additional study showed that when teachers enjoyed the trainings they received in physical education and learned its impact on health, they decided to share the experience with their students in order to further promote physical activity (25).

The qualitative assessment revealed that different components of the intervention program, involving the various dimensions of the ecological model, each contributed to meeting the program objectives and led to behavioral change (14).

An important factor in the program's success was the schoolchildren's participation in planning, application, and implementation of the program. Children were trained on how to

perform an active break, while selected students rotated responsibility for leadership of this period's activities, with new students chosen every 3–4 weeks. Since these changes had been planned by their classmates, students found it easier to accept them.

The mothers' involvement positively influenced the intervention's success, as the mothers helped plan and implement the program. The mothers' role began with participation in the school health steering committee. Although the committee included only 3–4 mothers, each of them spread the information that was discussed at the meetings and being applied at the schools. Mothers also attended the workshops held at each school and the mother-daughter activities (25,26). Their role was most effective at the private school since the school did not implement all the required changes, particularly those at the canteen. Since the mothers were interested in the program and its offerings, they attended all of the workshops and prepared the healthy meals/sandwiches for their daughters. Schmied and his colleagues (28) suggested that participation of family members in the intervention increases the program's impact. All of the school staff (the principal, coordinator, teachers, and the owner of the canteen) as well as the parents demonstrated their full support for the program throughout its implementation period and expressed their commitment to continuing the program. During the regular visits to the schools, the researcher followed the activities and gave her feedback on the progress of the program and informed the team whether the intervention was going as planned or not. In general, through tracking participants' experiences before, during, and after the intervention, process evaluation enhances sustainability as well as providing an accurate description for designing future

projects (29).

In summary, the factors that emerge from the process evaluation that promoted successful implementation of this program included the commitment and involvement of the principal and administration, training of a large percentage of the teachers rather than a single representative, involvement of mothers and children as well as teachers and administration, and follow up and encouragement on the part of the researcher. The private schools opted to implement a smaller percentage of interventions, possibly due to economic factors.

#### ***Limitations of this study***

This study is limited by the absence of process data from control schools. Since these schools had been randomized to the no intervention condition, we were concerned that any data collection other than the pre-post-questionnaire would be perceived as an intervention and adversely affect the control condition, and promote them to do better on their own. The comprehensive multi-sector design of the intervention did not permit an isolated assessment of the different factors of the intervention. The study is also limited by the fact that the researcher conducted the process evaluation, but this enabled direct insight to witness the implementation of the program.

#### **Conclusion**

Up-front design of the quantitative and qualitative process evaluation enabled a structured evaluation throughout the entire intervention and added insight as to variability and factors that enabled or obstructed timely execution of planned activities. The process evaluation indicated the intervention with its several components was implemented with successful results leading to the desired changes in the school

environment and healthy habits of the participants. Process evaluation further identified factors that will contribute to the sustainability of the intervention even when

the researchers withdraw, and will facilitate the design of more effective interventions in the future.

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