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A process evaluation using the RE-AIM framework

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Original research

Translating the PLAYgrounds program into practice: A process evaluation using the RE-AIM framework

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ABSTRACT

Objectives: To present the results of the process evaluation of the PLAYgrounds program, using the RE-AIM framework.

Design: This study provides information regarding Reach, Adoption, Implementation and Maintenance. **Methods:** The PLAYgrounds program promotes increasing levels of physical activity in 6–12 years old children and was evaluated using the RE-AIM framework in 4 intervention schools. Data collection consisted of a physical activity questionnaire with children ($n = 765$, Reach), SOPLAY observations (Implementation and Maintenance), questionnaires on the satisfaction of the implemented elements with teachers ($n = 59$) and children ($n = 730$, Implementation) and interviews for increased depth of information. In addition a simple counting of participating schools, describing of non-participating reasons and characteristics of the schools were documented (Adoption).

Results: Reach of the target population (i.e. inactive children) was 60.7% ($n = 464$) and the target population was representative for populations in low-SES neighbourhoods. The PLAYgrounds program was adopted by 4 schools (80%), at which 5 (from 7) program elements were successfully implemented. At 18 months follow-up, 3 of those 5 elements were completely maintained.

Conclusions: Adoption, Implementation, and Maintenance proved to be very high. Most likely due to the PLAYgrounds program being a complete intervention package that included financial, material, and staff support. Therefore, it is recommended to retain this high level of support when introducing the PLAYgrounds (or any other intervention) program in schools. In the future it would be recommended to evaluate the PLAYgrounds program on maintenance in schools where the key-person is employed at the school and funding is not available.

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1. Introduction

Worldwide, only one third of all children meet the daily physical activity (PA) recommendations.^{1,2} This is troublesome, because inactivity has been shown to be associated with different negative health consequences, such as coronary heart disease³ and obesity.⁴ Therefore, promoting physical activity (PA) in children is a major public health priority.

Schools have been identified as logical places to promote PA in children, with children spending a large part of their regular days in school⁵ and the possibility to reach children at all socio-economic levels.⁶ In an effort to use these possibilities of schools, a playground intervention (PLAYgrounds) was developed to increase PA levels during recess. The intervention was based on an ecological approach, which was accomplished by a change of the

physical and social environment. In order to increase the effectiveness, different effective components from earlier playground studies were implemented, i.e. time-management,⁷ playground markings,^{8,9} provision of play equipment,^{10,11} and adult supervision and encouragement.¹² Beside those elements, supporting PE lessons were part of the PLAYgrounds program to provide a stimulus on the long-term.¹³

Previous playground studies all provided an evaluation of the effectiveness of the intervention, though recently the importance of evaluating the context in which interventions are implemented has been identified as critical.¹⁴ Above all, PA efficacy studies are evaluated under optimal conditions and the intended end-users in real-world settings might be less motivated after the intervention period has ended and external supports are withdrawn.¹⁵ If intervention programs are not adopted to an adequate extent and then maintained, it is unlikely that these programs will have any impact on public health. To evaluate research translation,¹⁶ the RE-AIM¹⁷ model provides guidance. This is a systematic model, which could be used to guide the evaluation on the external validity of

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Table 1
Outline of the elements of the RE-AIM model, the measurement methods and the outcome measures.

Element	Definition	Outcome measure(s)	Method(s) of assessment
Reach	Participation of the target population	Percentage of children who are inactive	Questionnaire on daily PA levels providing the no. of children who do not meet the guideline divided by those who meet the guideline
	Representativeness of the participating population	Characteristics of the participating population compared to comparable low-SES neighborhoods	Ethnicity and classification of weight for both populations, provided by the Municipal Health Services
Effectiveness	Outcome measure: PA levels during recess ²⁰	Energy expenditure during recess	SOPLAY observations
	Participation rate of the invited schools	Schools that were willing to participate in the PLAYgrounds program	1. No. of schools that participated divided by those who declined 2. Non-participation reasons
Adoption	Representativeness of settings	Participating school's characteristics compared to data on non-participating schools	1. No. of children 2. Average no. of children per school 3. Teachers to children ratio 4. Playground size 5. Playground lay out 6. No. of schools that participated in other health projects
Implementation	The extent to which participating schools implemented the different elements of the program	No. of schools that implemented the intervention elements	SOPLAY observations, elaborated with quantitative data on program elements at F1 and F2
	Satisfaction on the different elements of the program	Qualitative data on satisfaction on the implemented elements	Self-administered questionnaire and interviews at F1 and F2
Maintenance	The extent to which schools maintained the implemented elements of the PLAYgrounds program	No. of schools that maintained the implemented elements	SOPLAY observations, elaborated with quantitative data on program elements at F3

No., number; F1, follow-up 1 (5 months), F2, follow-up 2 (10 months); F3, follow-up 3 (18 months).

the intervention, i.e. the validity in real-world settings.¹⁸ Austin et al.¹⁹ used the RE-AIM model to evaluate an existing effective playground intervention⁸ and provided useful information on the translatability of the intervention.

As the effectiveness of the PLAYgrounds program is evaluated in another paper,²⁰ the aim of this paper was to examine the barriers and success factors of translation of the intervention into practice. The RE-AIM model was used to guide this evaluation, with the focus on Reach, Adoption, Implementation and Maintenance.

2. Methods

This evaluation is part of a controlled trial on the effectiveness on PA levels of the PLAYgrounds program in primary school children aged 6–12 years.²⁰ All participating schools were located in the west of Amsterdam, a low socio-economic area. The schools are united in a board (STWT) and this board has a partnership with the Academy for Physical Education (ALO) on student internships, which are focused on teaching PE and promoting health. At each school an oral presentation was given about the aim, benefits and organisation of the intervention.

Intervention and control schools were matched according to the number of pupils, playground size and the usage of the playground before the start of the intervention. PA levels prior to the intervention were assessed by the observation method SOPLAY.²² There was no significant baseline difference in energy expenditure at the playgrounds in the intervention and control group, which was respectively 0.075 kcal/kg/min (SD 0.01) and 0.082 kcal/kg/min (SD 0.02) (i.e. 4.5 and 5 METS, light intensity PA).

The intervention group received the PLAYgrounds program for one school year (ten months, September 2009–June 2010), while the control group followed their regular routine. Parents gave their approval for the participation of their children following passive informed consent. The study design, the procedures and the informed consent procedure were approved by the

Medical Ethics Committee of the VU University Medical Centre (NTR2386).

A full description of the intervention has been published elsewhere.²¹ In short, the intervention consisted of physical alterations of the playground, each tailored to each school, by which different areas for different games were created (for example a throw and catch area and a soccer field). Some of these areas were defined as hotspots, i.e. places where the majority of children would like to play. Through hotspot management all children were able to play at these popular areas. Additional play space per child was created through altered recess time management, reducing the number of children on the playground at any given time.

Active usage of the playground was encouraged through the provision of play equipment, through supporting PE classes with playground activities and monthly themes, and through supervision and encouragement by teachers and parents, who participated in activities. Each class received a box with playground equipment, which consisted of throw-and-catch equipment, ropes, balls, juggling equipment and equipment for different tag games. Themes of activities were scheduled to provide a new stimulus every month and the regular PE lessons presented ideas on how to use the playground and available equipment corresponding to these themes. The teachers were scheduled to play together with the children once a week and parents were invited once a month to join the children at the playground.

The RE-AIM model was used to evaluate the translatability of the intervention. Table 1 shows an outline of the elements of the model, the outcome measures, as well as the methodology employed to register the required data. The current evaluation focused on Reach, Adoption, Implementation and Maintenance. Effectiveness was evaluated in a separate analysis.²⁰

Data collection consisted of different methods to address all RE-AIM components (Table 1). Reach was defined as the representativeness of the study population, and was described by a comparison of characteristics to a population of other low-SES neighborhoods in Rotterdam, a city comparable to Amsterdam in

Table 2
Characteristics of the participating and non-participating schools.

	Participating schools (n = 9)	Non-participating schools (n = 5)	School that did not start the preparation (n = 1)
No. of children	2620	1591	329
Average no. of children per school	291	318	329
Teachers to children ratio (mean, SD)	1:19.4 (2.5)	1:22.2 (1.6)	1:23.0
Playground			
Size in m ² (mean, SD)	850 (50)	900 (20)	870
Lay out (no. of schools with playground markings)	2/9	2/5	0/1
No. of schools that participated in other health projects	4/9	2/5	0/1

No., number; SD, standard deviation.

regard to population and demographics. The Rotterdam Municipal Health Service provided information on inactivity, ethnicity and classification of weight for their population. The Municipal Health Services of Amsterdam provided information on the classification of weight and ethnicity was derived from the school register. At the start of the school year (September 2009), all children aged 9–12 years old completed a PA questionnaire. The questions and methodology employed are used as the standardised indicator for PA in youth in The Netherlands and have been used in previous research on PA promotion.²³ It includes in total 6 questions about the frequency and duration of PA in leisure time and sport participation during the last week. Leisure time was defined as after school hours and weekend hours, sport participation was defined as a structural weekly lesson at a sports club.

Adoption was defined as the participation rate of the invited schools and in order to get insight in the barriers to adopt the program, non-participating reasons were documented. In addition, characteristics of the schools were described to define the representativeness of the settings, such as the number of children, playground size and layout (existence of playground markings).

In order to measure the Implementation and Maintenance, the SOPLAY observation protocol²² was used. Besides a quantity measure (to determine PA levels at baseline and during the intervention, see Effectiveness), the protocol also provides information about aspects related to the social environment. Observations were further elaborated with quantitative data on program elements, such as time-management and hotspot-management. After 16 h of training at different playgrounds an inter-observer agreement of 88–96% was obtained between two observers (the researcher and the internship student at the different schools). The playground was observed as a whole every 5 min from left to right. A total of three observations per school were done (at follow-up 1, 2 and 3, i.e. 5, 10 and 18 months). The number of schools that implemented and/or maintained the different elements of the program was documented.

The teachers and the children (9–12 years old) from the intervention schools completed a questionnaire on satisfaction at follow-up 1 and 2. The answers of the questionnaire were organised on a 5-point Likert scale. The questions for the teachers were focused on the practical implications of the program, the amount of guidance and interference, number of arguments between children and whether the PLAYgrounds program could become standard in the school routine. Both children and teachers were asked for their opinion on the restructuring of the playground, the play equipment and the supporting PE program. Children were also asked about the amount of joy and about their perception of being stimulated into becoming more physically active. The two upper answer categories were combined as well as the two lower categories to describe the results of the questionnaire in percentages of satisfaction on implementation.

In order to get a greater depth of information derived from the questionnaires, interviews with 6 teachers (1 per grade) and with three different age groups, consisting of 8 randomly chosen

children per group (total of 24 children) were held at the same follow-up stages as the questionnaire.

3. Results

The schools ($n = 15$) that were invited to the PLAYgrounds program consisted of 4540 children. The study population (a total of 4 intervention schools) consisted of 1155 children at the start and 1094 children at the end of the school year. A total of 765 children (only the 9–12 years old children) completed the PA questionnaire at the start of the school year, from which 60.7% ($n = 464$) was defined as physically inactive. Our study population consisted of 70.6% children with immigrant parents and a high percentage of overweight (30.7%). In Rotterdam, 63.2% of the children were physically inactive, 69.0% of the children had immigrant parents and 29.0% was overweight.

The Effectiveness of the intervention is published in another paper,²⁰ but presented here in short form. Recess energy expenditure at the intervention schools (as measured through SOPLAY observations) was 0.105 kcal/kg/min (SD 0.01) (i.e. 6 METS) after follow-up, which was significantly different ($p < 0.01$) from the control group (0.074 kcal/kg/min (SD 0,01) (i.e. 4 METS)). These results show an increase in from light intensity PA to moderate intensity PA, with 77.3% of the children engaging in moderate to vigorous intensity physical activity (MVPA).

A total of 15 schools were invited to enrol in the intervention, from which 10 schools responded positively (66,7%). Since intervention and control schools were matched, five schools adopted the program. After the working group meetings, 80% (4/5) started the actual preparation of the intervention. The five schools that responded negatively to the invitation declared they had the following non-participating reasons: (a) their playground already was restructured by the Nike Zone foundation (2/5), (b) the school was enrolled in other PA programs and therefore had a lack of time (2/5), (c) they thought their children were physically enough (1/5). Table 2 shows the representativeness of the participating schools. The non-participating schools consisted on average of more children per school (318–291) and had a higher teacher to children ratio (1:22–1:19). Playground size and lay out as well as the number of schools that participated in other health projects were comparable. In order to present all data, the characteristics of the school that did not start the preparation are presented in Table 2 in a separate column.

Table 3 shows the Implementation at follow-up 1 and 2. Questionnaires on satisfaction were completed by 744 children and 60 teachers at the five month follow-up and by 730 children and 59 teachers at the ten month follow-up. The re-structuring of the playground, the time-management and the hotspot-management were completed by all schools (4/4). The restructuring was accepted by 80% ($n = 584$) of the children and 100% ($n = 59$) of the teachers. All teachers ($n = 59$) were positive about the recess time-management and the hotspot-management. For example, soccer did not dominate the school playground anymore and therefore a variety of

Table 3
Implementation and Maintenance of the different elements of the PLAYgrounds program.

Intervention schools <i>n</i> = 4	Implementation follow-up 1 (5 months)	Implementation follow-up 2 (10 months)	Maintenance follow-up 3 (18 months)
Restructuring of the playground	4/4	4/4	4/4
Time-management	4/4	4/4	4/4
Hotspot-management	4/4	4/4	2/4
Play equipment provision	4/4	3/4	2/4
Supporting PE program	4/4	4/4	4/4
Participation of teachers	3/4	2/4	2/4
Participation of parents	1/4	1/4	1/4

games were played compared to the control schools, where limited space was left for other games or for more timid children. The high level of satisfaction was associated with a lower number of arguments between children (1–2 per recess, compared to 6–9 per recess at the control schools) and (for teachers) the decrease in guidance that was required through the school year.

Provision of play equipment was implemented by all schools (4/4) and the observations showed that the box with play equipment contributed to the variety of games that were played compared to the control schools (15 versus 3). At follow-up 1, the box was used by all teachers (*n* = 59) and by 90% of the children (*n* = 670). The children that did not use the box stated that they played games for which they did not need any equipment. At follow-up 2 one school did not use the box with play equipment as frequently anymore as at follow-up 1, because teachers and children stated that there was not enough variation in equipment throughout the school year.

At all schools (4/4) the supporting PE program had started. PE teachers stated that the program fitted well into the PE curriculum. The observations confirmed that less time was spent on rules and organisation at the playground compared to the control schools (30 s–1.5 min compared to 2–6.5 min). Classroom teachers felt that the supporting PE program was motivational for the children (the theme of the month in particular). Children stated that they liked recess time more, because of clear game rules and better practised motor skills, which they needed for the activities on the playground.

At three schools teachers played together with the children every week at follow-up 1. At follow-up 2 there was a decrease in number of schools where the teachers played together with the children on a weekly basis (2/4). Teachers stated that they needed recess time to get some rest from teaching and to talk to other teachers, rather than playing together with the children. At one school only, parents participated during the monthly recess invitation (same for follow-up 1 and 2) and teachers stated that they were disappointed in the parent participation. Children stated that they were positively surprised and encouraged by the teacher and parent participation.

Due to the playground program, 85% of the children stated that the amount of joy was higher. Almost all children (91%) felt that they were more stimulated to be physically active and mentioned different reasons for the stimulation: the restructuring of the playground, the play equipment, the PE lessons and the adult participation.

Most implemented elements were maintained throughout the next school year (Table 3). Hotspot management and the box with play equipment were still in use (4/4), but in some schools in some extent undisciplined (2/4). Teacher participation and (2/4) and parent participation (1/4) were the least sustainable components of the PLAYgrounds program.

4. Discussion

The aim of the PLAYgrounds program was to stimulate PA levels of children. The effectiveness of this intervention is described in

another manuscript.²⁰ The PLAYgrounds program was associated with an increase in recess PA levels from light intensity PA to moderate intensity PA. Recess in The Netherlands lasts 15 min per day. As such, the intervention could contribute 25% to the Dutch guidelines for PA. The current evaluation aimed to provide information on the barriers and success factors surrounding the implementing of this effective intervention.

The percentage of children who were inactive (assessed with the PA questionnaire) could be higher, because self-reported questionnaires are known to be vulnerable to recall biases and social desirability.²⁴ However, our study population was representative for the population of children in low-SES neighbourhoods.²⁵ In order to promote a broader dissemination of the intervention, the Adoption, Implementation and Maintenance were evaluated and showed to be high.

The main reasons to adopt the program were that the program was offered to the schools as a complete intervention package including funding, support and research. This underlines the fact that schools are busy places where the core business is learning and less time remains for other intentions, like stimulating PA.²⁶ Two (of three) reasons for not adopting the program were involvement in other PA programs. Therefore, tuning with other health programs (from which an overflow is offered to schools) could enhance the adoption. At the school that did not complete the preparations, the decision to adopt the program was made top-down by the principal, whereas at the other schools it was discussed with the teachers first. Teacher involvement is highly important for adoption of a program.²⁷ One method to accomplish this is to explain about the benefits of the intervention for the end-users, either in behaviour, costs or satisfaction.¹⁹

The Implementation was evaluated by observations and by questionnaires and interviews with the end-users. Evidence derived from questionnaires and interviews has great practical significance, since the end-users provide information on their experiences.¹⁹ A limitation of our study is that the interview data collected was not audio recorded or corrected afterwards by the interviewers for accuracy. In addition, there was no coding or categorising into predetermined themes for analyses. Despite this limitation in methodology, the combination of these methods provided a full image of the barriers and success factors in Implementation and Maintenance of the program.

The implementation of the different elements of the PLAYgrounds program was successful, because the program was not too complex and therefore did not consume too much time.²⁸ At the start of the intervention guidance was required to let the children get used to the new structure at the playground, the use of the box with play equipment and the hotspot schedules. After three months it was part of the new school routine and less guidance was required. Despite the simplicity of the program, teacher training and support²⁸ was required to guide the classroom teachers in implementing the program. The support was given by the internship student, who played a role in the supporting PE program and who also was available at the playground (while the PE teacher had

to teach during recess). This provided ample opportunities to pick up Implementation problems and apply educational measures.

The least successful elements were the teacher and parent participation. Encouragement from adults stimulates children to be more physically active and to maintain a higher level of PA.¹² A recommendation would be to evaluate the program with the teachers to keep everyone focused and convinced of their participation at the playground. Using a schedule of teacher duty would concede to the needs of the teachers for a coffee break. Perhaps parent participation is not a key factor in stimulating children to be more physically active during recess and therefore this element could be left out of the program. On the other hand, parent participation once a month at the playground could inspire parents to play a variety of games with their children in leisure time. This could be necessary in order to stimulate children to meet the PA guidelines, since recess could only contribute up to 25% to the guidelines. In order to stimulate parent participation during recess, parents could be informed in a parent information meeting, by news letters and by a personal invitation from their own child.

After the intervention period had ended, most elements of the program were maintained, probably because the schools received annual funding and support. Funding is an important factor to adopt²⁹ and to maintain an intervention,¹⁵ in this program in particular, for well-kept playground markings and for replacing defective or lost play equipment. This provided an artificially high Maintenance of the PLAYgrounds program, which was made possible by the partnership between the STWT (providing funding) with the ALO (providing an internship student) and might be lower when this partnership would not have existed. Working in partnership increases the knowledge, skills, and resources of the end-users,²⁹ which was accomplished by the internship student.

Strategies to increase the Maintenance of the PLAYgrounds program should include a key-person who advocates the innovation.³⁰ In this program the internship student had this role and was of great value for the Implementation and Maintenance. Though in real-world settings, partnership in which funding and support is provided, is not common. Therefore a key-person from the school should be available. At the two schools that did not maintain the hotspot-management and provision of play equipment, no internship student or key-person from the school was available. In the future it would be recommended to evaluate the PLAYgrounds program in schools where the key-person is employed at the school and funding is not available. The program should then be integrated in the school system to be successful.³¹

5. Conclusion

This paper provides useful information on the barriers and success factors of the dissemination of the effective PLAYgrounds program into practice. Adoption, Implementation, and Maintenance proved to be very high. Most likely due to the PLAYgrounds program being a complete intervention package that included financial, material, and staff support. Therefore, it is recommended to retain this high level of support when introducing the PLAYgrounds (or any other intervention) program in schools. In the future it would be recommended to evaluate the PLAYgrounds program on maintenance in schools where the key-person is employed at the school and funding is not available.

Practical implications

• In this article practical recommendations on the Implementation, Adoption and Maintenance of the PLAYgrounds study are presented.

- Funding and teacher support seem to be the most important factors for adoption and maintenance of the program, which can be organised in a partnership with health or educational organisations.
- Schools are offered an overflow of interventions, so tuning with other interventions and evidence on effective interventions is needed.
- Teachers need to be inspired and taken into the development progress of PA programs in order to feel the necessity of stimulating PA in children at school.

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