



Title: Process evaluation of a fundamental movement skill intervention in school children using RE:AIM

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Abstract

The aim of this study was to investigate the utility of the RE:AIM (Reach; Efficacy; Adoption; Implementation; Maintenance) framework to evaluate a school-based fundamental movement skills programme with children in Auckland, New Zealand. Seven schools registered to receive a fundamental movement skills programme were invited to participate. Principals, teachers, and children in years 1-3 (ages 5-8) of participating schools were then invited to participate in evaluation activities, comprising: objective evaluation of children's fundamental movement skills; children's qualitative feedback; and teacher and principal questionnaires and interviews. Survey data were analysed descriptively and children's feedback and interview data were analysed using inductive and deductive analyses. Four schools agreed to participate, including 26 teachers. Of these, 16 teachers completed surveys, and six participated in one-on-one interviews at follow up. All children in years 1-3 (n=531) received the intervention of whom 138 agreed to participate in the evaluation. Overall, the intervention was successful; statistically significant increases in fundamental movement skills were observed, and evidence for adoption, ease of implementation, substantial reach, and maintenance of the intervention or skills developed through the intervention was observed. Success factors identified were specialist expertise, teacher professional development, and using a teaching games for understanding approach. Application of the RE:AIM framework to evaluate a school-based fundamental movement skills intervention was feasible and led to generation of in-depth insights for future research and intervention development and delivery.

Keywords: fundamental movement skills; RE-AIM

Introduction

Fundamental movement skills (FMS) are prerequisite motor functions needed to effectively participate and enjoy a wide range of sporting, recreation and individual pursuits (Vandorpe et al. 2012, Barnett et al. 2016). Children do not naturally learn FMS; they need to be provided with appropriate skill training and opportunities for practice to allow for skill development and refinement. There is a need to promote early interventions for FMS promotion (Vandorpe et al. 2011) and schools serve as an ideal setting. The acquisition of FMS is enhanced by training and education involving complex learning tasks that provide problem solving, compared to less difficult tasks (Logan et al. 2012). Research suggests that children attain mastery sooner through the interaction of a trained teacher, coach or parent to bring context to learning situations and give purpose to play (Drost and Todorovich 2013).

Although efficacy of FMS interventions has been established (Morgan et al. 2013), less is known about other factors that may contribute to the overall success of a given intervention. RE:AIM is a framework offering a systematic approach to review the impact of public health interventions. Originally conceived by Glasgow et al., (1999) the central tenet of the framework is that the ‘ultimate impact of an intervention is due to its combined effects on five evaluative dimensions’ comprising: (a) Reach – The number of people affected by the intervention and whether they are representative of the general population, (b) Effectiveness – The impact of the intervention on intended outcomes, (c) Adoption – The number of settings that are involved and whether they are representative of settings overall, (d) Implementation – Whether the intervention was successfully implemented, and (e) Maintenance – Long term effects of the intervention and sustainability. A recent review of process evaluation studies with an RE-AIM approach on physical activity interventions for children has highlighted the need PA interventions in children to report on real-world challenges and limitations (McGoey et al. 2016). The application of RE:AIM may provide a much broader evaluation of a FMS intervention’s success than quantitative evaluation of changes in FMS skills alone. Accordingly, the aim of this study is to investigate the utility of the RE:AIM framework to evaluate a school-based FMS intervention with primary school-aged children in Auckland, New Zealand.

Methods and Procedures

Protocol

The Get Set Go programme was delivered into Auckland schools between 2013 and 2015. Data collection comprised a range of methods to address each of the five dimensions of RE:AIM (Table 1).

Ethical approval to conduct the research was provided by the Host Institution ethics committee in November 2012 (AUTEC 12/249).

Table 1

RE:AIM Dimensions, Level of Impact, Variables, Data Type, and Data Source For the Intervention

Dimension	Variable(s)	Data Type	Data Source	Time of data collection
Reach	Proportion of classes, teachers, and children participating	Quantitative	Principal questionnaire: school roll, reported number of children, teachers, and classes participating	T0
Efficacy	Child FMS scores	Quantitative	TGMD-2	T0, T1, T2
	Teacher reported confidence teaching FMS	Qualitative	Open ended responses from teacher surveys	T1
	Child enjoyment and feedback	Qualitative	Open ended responses from teacher one-on-one interviews Literacy session where children use creative writing to express their views on the programme	T2 T1
Adoption	Proportion of classes, teachers, and children participating	Quantitative	Principal questionnaire: school roll, reported number of children, teachers, and classes participating	T2
	Number of sessions delivered	Quantitative	Principal questionnaire	T2

Implementation	Teacher perceptions	Quantitative	Teacher rating of programme quality	T1
		Qualitative	Open ended responses from teacher questionnaire and interviews on barriers and facilitators to programme implementation	T1, T2
	Teacher professional development attendance	Quantitative	Professional development attendance reports	T1
Maintenance	Number of teachers continuing to implement Get Set Go	Quantitative	Principal questionnaire	T2
	School H&PE plan in place with focus on FMS development	Quantitative	Principal questionnaire	T2

Notes. FMS = fundamental movement skills, H&PE = health & physical education, T0 = baseline assessment, T1 = post intervention assessment, T2 = follow up assessment, TGMD-2 = Test of gross motor development-2.

Intervention

Get Set Go was a two-year game-based multi-component programme designed to increase children's FMS. The programme comprised an ongoing interactive process based on children's needs, following a Teaching as Inquiry Cycle (Strasser et al. 1971). Go Set Go was delivered within the school syllabus by independent, certified coaches. Class teachers were required to contribute to programme delivery. Provision of specialist physical education teachers in state (government-funded) primary (elementary)

schools in New Zealand is uncommon, and teachers are predominantly generalists. Teachers participated in a one-day training course that covered FMS theory and development, needs analysis of students, assessment and planning strategies, and links to the school physical education and curriculum plan. In total, eight, weekly in-class training sessions were delivered to students, as detailed in Table 2. Coaches delivered the preliminary sessions and thereafter supported teachers to run sessions, conduct observations, and generate games through direct feedback and critical reflection.

Table 2

Intervention Delivery Components

Session	Content	Delivery responsibility	Duration (minutes)	End task/outcome
1	Introduction Skill 1 training session and games	Specialist	45	Children to practice at home Encourage teacher to repeat games during the week
2	Skill 1 training session and games	Specialist	40	Two skills finalised for next session
3	Skill 2 training session and games	Specialist	40	'Homework' for teacher to create a game
4	Skill 2 training session and games <ul style="list-style-type: none"> • Teacher delivers the game they created (10 min) • Specialist observes/aids and provides feedback • Specialist delivers remaining session 	Teacher and specialist	40	n/a
5	Skill 2 training session and games Delivery by specialist, teacher starts observation and assessment of children	Teacher and specialist	40	Move onto third skill Teachers to continue to observe children in different forums

6	Skill 3 training session and games	Specialist	40	'Homework' for teacher to create a game
7	Replication of week 4 with Skill 3	Teacher and specialist	40	Have children write and draw about the programme
8	Skill 3 training session and games Reflection	Specialist	60	Teachers feedback In class self-reflection writing and drawing activity for children

Throughout the eight-week programme, teachers and children were encouraged to plan and develop games that were meaningful to them. The programme followed a pedagogical model of teaching games for understanding (Werner, Thorpe, and Bunker 1996). Children were involved in the creation of the game and play to the rules that they had created. After the games had been created and played (and sometimes modified) the children were asked to create, write, draw or make a video about the experience.

For the purposes of this study, FMS skills taught and assessed were skipping, running, catching, and over-arm throw. The final session (session eight) was followed by a literacy lesson during class time, which included children writing about their skills and experiences.

School, teacher, and child participant recruitment

A list of schools due to participate in the Get Set Go programme was provided to VB by Sport Auckland, the Regional Sports Trust responsible for the coordination of the programme into schools. All schools were approached by VB to arrange a one-on-one consultation with every school Principal. Each Principal was provided with a study-specific information sheet, a school consent form and an opportunity to discuss the research. If Principal (school) consent was given, recruitment of participants (children and teachers) commenced as soon as practically possible and school demographic data were collected.

All junior children aged 5-8 years (school years 1-4), and their classroom teachers, from participating schools were eligible to participate in the research. Children's parents/caregivers were sent parent information and consent forms for their child to participate, and child information and assent forms via take home packs from the class teacher. Teachers were provided with teacher information sheets and consent forms. For a child to participate in the research, both parental consent for their child to

participate and child assent were required. Teacher consent was only required for their engagement with the teacher survey and interview evaluations of the intervention.

Inclusion and exclusion criteria

Any temporarily or permanently disabled children, as identified by the school, were excluded from being objectively assessed for FMS as part of this research but were not excluded from participating in the Get Set Go programme.

Measures

Principal questionnaire. At baseline and follow up, all school Principals were asked to report on their school roll as well as the number of children, teachers, and classes currently participating in the programme. Principals were also asked to report whether their school had a health and physical education plan in place that included FMS development strategies at baseline and at follow up.

Principal and teacher interviews. Principals and teachers were invited to participate in one-on-one interviews at follow up. Interviews were semi-structured, with specific questions on perceptions about the most beneficial components of the programme, key messages about the programme, areas for improvement, and most challenging parts of the programme. Interviewees were invited to share any further information related to the programme. The funding model for delivering the programme was shared at Principal interviews only to generate discussion on programme costs, and discussion around confidence in teaching FMS was conducted for teacher interviews only.

Teacher surveys. A study-specific questionnaire was developed to capture teacher reports of their students' participation in, and enjoyment of, physical education; perceived motor proficiency of their students; their own enjoyment of physical activity, and programme evaluation. Additionally, the same open-ended questions used in the one-on-one interviews (i.e., items on the programme benefits, challenges, key messages, areas for improvement, and confidence in teaching FMS) were also employed. The survey was implemented immediately post intervention. With the exception of one closed item that rated the quality of the programme (on a 4-point Likert scale, from poor to excellent), only responses to the open-ended items were used for the purposes of this research.

Children's feedback. This was gathered through a creative writing and drawing process after session eight of the programme. Teachers worked with the children to generate feedback in the form of letters to the coach, cards to family members, class posters, stories and postcards.

Additional context. Quantitative data on teacher attendance to each professional development session was collected by the trainer delivering the professional development sessions.

FMS assessments. These were conducted by a trained researcher using the Test of Gross Motor Development version 2 (TGMD-2) (Ulrich 2000). This tool requires the participant to perform a skill and the evaluation of skills is broken down into three or four criteria. Each participant is scored on each skill attempt, depending on whether they successfully perform the skill criterion. For the purposes of this research, two object control skills (overarm throw, catch) and two locomotor skills (running, skipping) were assessed and treated as individual outcome variables in the analysis. Assessment of FMS occurred at baseline (T0), immediately post the 8-week intervention delivery (T1), and 6 months post the baseline assessment (T2). All FMS assessments were conducted in groups of 4-6 children.

Analysis

SPSS.20 was utilized to create the data set and complete analysis of the objective FMS objective assessments. Information collected from the teacher surveys and children's text and drawings were analysed descriptively and thematically. Thematic analysis comprised deductive approaches (identifying barriers and enablers to teaching FMS, strengths and weaknesses of the intervention) and inductive analysis to identify any emergent themes (Attride-Stirling 2001).

Group differences among the FMS variables were identified using t-tests. The Generalized Linear Model (GLM) procedure on SPSS.20 was used to test for intervention effects in which time (baseline, post intervention, follow up), ethnicity (New Zealand European, Māori/Pacific, Other ethnicities), school decile (decile six and nine) and sex (male, female) were entered as predictors and the motor skills (running, skipping, catching, over-arm throw) were specified as the outcome variables. School decile is a broad measure of area-level deprivation based on census statistics, with deciles 1 and 10 indicating a higher proportion of children from low socio-economic households and higher socio-economic households, respectively, attending the school. The analysis examined all 2-way and 3-way interactions. Model effects were tested through the chi-square test. Significance was set at $p < 0.100$ was used to select variables for retention in the final GLM model during the model building selection process, and $p < 0.050$ was used to indicate effects that were statistically significant. .

Results

Participants

Seven schools registered with the Get Set Go programme of which four agreed to participate in the current process evaluation, including 26 teachers. The three schools that did not participate reported 'busy timetables' or 'no interest' as reasons for not participating. Of the 26 classroom teachers that

participated in professional development and in class delivery, 16 completed and returned post intervention surveys. Of those 16 teachers, six agreed to one-on-one interviews at follow up.

All children (n=531) aged 5-8 years from the four participating schools were invited to participate in the intervention evaluation. There was a 26% response rate at baseline, totalling 80 boys and 58 girls ranging from 5 years to 8 years 7 months of age (mean = 6 years, 9 months, SD = 8.32 months). Response rates from potential participants varied (non-significantly) across schools. There was no statistical difference at baseline for sex (p = 0.495) or ethnicity group (p = 0.843) of the child. All participants measured at baseline were measured post intervention (T1) and at follow up (T2). Baseline characteristics are displayed in Table 3.

Table 3

Baseline Sample Characteristics and Sex Difference

	Boys (n = 80)	Girls (n = 58)	p-value
	Mean (SD) or n	Mean (SD) or n	
Age (years)	6.08 (0.86)	6.10 (0.81)	0.400
Ethnicity			
NZ European	50	36	0.054
Māori/Pacific	10	9	0.118
Other	19	13	0.088
Not recorded	1	0	n/a
School decile			
6 (medium SES)	29	14	0.072
9 (high SES)	51	44	0.051

Notes. n = number of participants, SD = standard deviation, SES = socio-economic status.

Intervention evaluation

Reach. All junior children on the school roll received the Get Set Go programme delivered within the school syllabus. Principals indicated in their feedback they were appreciative of a specific junior programme that could be delivered to all classes. Principals reported that often sports providers suggest their programmes are suitable for the younger age groups when in reality they do not meet the needs of

their students or their teachers. Principals were conscious of teacher time and involvement required when implementing new programmes, especially with the junior classes.

The specialist delivery component of the intervention, professional development and resources for teachers comes with implementation costs. Within the Auckland central region this cost is eliminated from schools through organization initiatives, partnerships and funding. Removal of the cost to schools increased the reach of the programme.

Efficacy. Efficacy of the programme was measured at the individual level and used results from direct observation of children’s FMS, teacher feedback through questionnaires and interviews and student feedback via creative writing classroom work.

Direct observation. Table 4 displays the mean and standard deviation for the TGMD-2 scores for the four motor skills across the three assessment times. Scores for boys and girls are provided separately. Overall, there was a significant increase observed across all four FMS skills ($p < 0.001$ for all) over the assessment periods. Most notable changes were observed with younger children who displayed greater incremental increases than older children.

Table 4

Individual Motor Skill Results of the TGMD-2 Assessment Across the Three Time Points

FMS Assessment	Time	Boys Mean (SD)	Girls Mean (SD)
Running	T0	5.82 (1.99)	5.71 (1.76)
	T1	6.85 (2.14)	6.66 (1.61)
	T2	7.70 (.66)	7.52 (.84)
Skipping	T0	3.86 (1.57)	4.22 (1.35)
	T1	4.36 (1.74)	4.90 (1.63)
	T2	5.41 (1.10)	5.71 (.88)
Catching	T0	5.76 (2.03)	6.17 (1.70)
	T1	6.16 (2.48)	6.72 (1.94)
	T2	7.30 (1.14)	7.24 (1.22)
Overarm throw	T0	4.83 (2.09)	4.47 (1.94)
	T1	5.63 (2.27)	4.98 (1.77)
	T2	6.95 (1.35)	6.71 (1.53)

Notes. FMS = fundamental movement skill, SD = standard deviation, T0 = baseline assessment, T1 = post intervention assessment, T2 = follow up assessment, TGMD-2 = Test of gross motor development-2.

Children who identified as Māori or Pacific ethnicities had significantly higher motor control (catch and over-arm throw) skills than the children of New Zealand European or 'other' ethnic groups at baseline ($p < 0.001$). In contrast children of New Zealand European ethnicity demonstrated higher scores for skipping than the other two ethnic groups ($p < 0.001$).

Boys significantly attained greater over arm throw scores younger than girls when matched with their age groups. Boys also scored significantly higher at the over-arm throw regardless of age ($p < 0.001$).

At baseline, decile six schools scored significantly higher for the catching score than decile nine schools ($p = 0.002$ and $p < 0.001$ respectively). At baseline and post intervention, throwing skills were significantly higher ($p = 0.005$ and $p < 0.001$ respectively) at decile six schools than decile nine schools. There were no significant differences between school decile at follow up.

Teacher feedback. Teachers reported increases in confidence delivering physical education due to improved class management skills outside the classroom, increased knowledge on planning a session, new game and activity ideas, increased knowledge on the importance of activity and physical education for child health, and new ideas to integrate into the curriculum. Main highlights of the programme reported by teachers were that it was 'the best professional development they have ever had', 'the coaches were knowledgeable and professional' and the 'kids loved them', and 'great resources'.

Through thematic analyses of post intervention surveys and one-on-one interviews two key themes were identified: (a) Increased (teacher) confidence in teaching physical education, and (b) increased (teacher) understanding of importance of physical education, physical activity and FMS. Feedback from teachers identified they were continually struggling for activity ideas that were challenging and enriching for their students. There were many concerns around 'being that teacher, that can't teach physical education' or 'wasting time sending children for a run around'. Teachers also noted an increase in confidence and enjoyment through participating in the intervention '... not only have I realized I can teach physical education but I'm enjoying taking my class out'. Of the 16 classroom teachers that completed a survey 12 reported themselves as not fully understanding the importance of physical education, physical activity, or FMS: 'PE has always been this thing that we have to do and to be honest if I could get away without doing it then I would'.

Children's feedback. Two common trends were seen throughout all of the examples, which included the games played, and the coach that worked with them. Most children made reference to the specific skills that they learned and many made mention of their favourite game(s). The content of the feedback about games was all very positive as children found the games 'fun... exciting... the best games ever.....so cool'. Some of the more interesting and revealing feedback suggested that children 'enjoyed sharing our games with you' 'loved learning new things' 'thank you for letting us make up our own games'. All children made reference to the particular coach that they had working with their class: 'thank you for listening to us', 'I like the way you are so calm to us. Thank you for teaching us so many things'.

Adoption. All 26 junior classes from across the four participating schools and all 531 children aged 5-8 years in attendance at the four schools participated in the Get Set Go programme. Eight additional teachers, including teacher aides were provided with professional development to allow continued implementation and support within the school setting. This resulted in 34 teachers participating in the professional development. This extra support allowed for cover for sickness, and assistance in planning and delivery. The number of additional sessions delivered varied widely across all classes at each school and between schools. Schools with clearly documented physical education plans, or a designated 'sports coordinator', on average delivered more additional sessions than schools without. None of the schools had physical education plans that included Get Set Go or FMS as specific components of their plans. Additional Get Set Go sessions were more likely to be delivered during the eight-week intervention with an average of 103 additional sessions being delivered. This figure dropped to an average of 87 at follow up for the following eight-week period.

Implementation. There were many barriers and enablers to implementing Get Set Go that were reported by the teachers and principals. Some teachers reported negative initial feelings towards the programme as there was a perception that it would increase workload. All 16 teachers who completed the post intervention survey reported there was value to the programme and that they were excited or looking forward to start implementing Get Set Go. Nearly all (n = 15) of the teachers reported the professional development as excellent while one of the teachers reported it as good.

The eight-week activity sessions involved an element of teacher delivery and this was not managed by all of the teachers. Teachers that did not attempt any planning or delivery of activity sessions reported 'not enough time for planning' and 'too many other commitments'. In contrast there was more positive feedback about the ease of implementation, for example: 'We have lots of snackivities [*short breaks in schoolwork to be physically active*] throughout the day and I have noticed a huge difference in their behaviour'.

Principals reported sustainability and impact of the programme as important factors when sending teachers and teacher aides on professional development. There was also a belief that it would ease the burden of responsibility if all teachers received the same training and help to develop a positive culture for implementation.

Maintenance. Maintenance was the area that scored the weakest out of all domains due to a number of barriers. 12 of the 16 teachers that completed a survey reported still using the Get Set Go games, activities and knowledge learned at least once a week to implement physical education with their class 12 weeks after programme completion. Teachers that were not continuing to implement the activities reported time constraints and delivery of different activities as the main contributing factors. All teachers involved in the one-on-one interviews reported they valued the programme and thought it was important for the children in their class to participate in the intervention. Teachers that were also parents reported ‘...wish I knew this information and these activities when I had my own children’.

Discussion

The aim of this research was to investigate the utility of the RE:AIM framework to evaluate a school-based FMS programme being delivered with young children in Auckland, New Zealand. Application of the RE:AIM framework to measure the success of this school-based programme led to greater insights than assessment of changes in FMS skills alone. Aligning with earlier research (Jenkinson, Naughton, and Benson 2012, McGoey et al. 2016) this study further informs the utility of the RE:AIM method for evaluating school-based health promotion initiatives. In particular, this approach facilitated the identification of key success factors as well as barriers to implementation and maintenance of the programme that would not otherwise be found (McGoey et al. 2016).

Findings from this study can be used to further develop school-based FMS and physical education programmes for improved outcomes across the spectrum of RE:AIM criteria. This approach also provided a holistic understanding of the sustainability of a programme as opposed to standard pre-post measurement of FMS. The ability to add context to the quantitative research findings was a particular strength and enabled identification of factors that may be crucial to ensuring intervention longevity and success. Although children experiencing physical or intellectual disability were excluded from the objective FMS assessments, application of the RE:AIM framework facilitated their inclusion in all other aspects of the research, improving representativeness.

Overall, feasibility of the RE:AIM approach was demonstrated in this research. However, it should be noted that researcher, participant, teacher, and school burden was greater than a standard pre-post FMS

evaluation, as significantly more data collection was required from a range of groups in order to adequately capture sufficient appropriate information across the RE:AIM components. The improvements in FMS observed post programme implementation align with other multicomponent FMS programmes conducted in New Zealand (Mitchell et al. 2013) and Australia (van Beurden et al. 2002). Using the RE:AIM criteria, the implementation of Get Set Go could be considered successful, with positive feedback provided by Principals, teachers and children.

Conclusion

Overall, findings suggest that RE:AIM is feasible and useful to employ for school-based FMS interventions and generated useful insights for future development of similar programmes. The intervention was successful, due to enhancing teachers' knowledge and skills in teaching FMS and physical education, utilizing a teaching games for understanding approach, and providing quality specialist support for teacher empowerment and engagement with children.

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