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Implementation of an intervention program with physical activity and healthy diet for health promotion at school: a possible challenge.

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ORIGINAL ARTICLE

ABSTRACT

The early development of chronic non-communicable diseases has represented the greatest concern in the health prevention in all countries. The goal of this research was to investigate how a program to promote the health of school children through physical activity and healthy diet can be implemented aiming sustainability and continuity. The participants of this study were 1098 students, aged 6 to 10 years, of both sexes. The students belong to two schools: experimental school (ES-n=592)/control school (CS-n=506). The project was implemented in 2013 (pre-test) and was followed until 2015 (post-test), with an intervention in 2014. The following variables were evaluated: nutritional status, level of blood glucose, cardiorespiratory endurance, fondness for exercises and 4 categories of food. The statistical analysis used was the Wilcoxon test (paired) and the Wilcoxon test (U of Mann Whitney) (independent samples), assuming a significance level of $p<0.05$. The results showed differences between ES and CS groups in the years 2013 and 2015. The biggest differences occurred in ES 2015. It can be concluded that the intervention was effective and implemented with intersectoral articulations to ensure sustainability and continuity.

Keywords: early intervention, physical activity, healthy eating, school health.

INTRODUCTION

Physical activity is associated with several health promotion benefits, but the majority of children do not reach the recommended levels. Particularly, on childhood obesity prevention, physical activity is embedded in most programs to reduce obesity, with results pointing to an association between high levels of physical activity with low body mass indexes (Metcalf, Henley, & Wikin, 2012).

Historically, the World Health Organization (WHO) has been publishing reports with guidelines for the prevention of chronic non-communicable diseases (NCD's) (WHO, 2005a; WHO, 2008a; WHO, 2009) in which physical activity and healthy eating are considered conditions for the promotion of health in combating the NCD's, in countries, in communities and at school. A report was published recently to end childhood obesity in the world (WHO, 2016), indicating the physical activity as one of the strategies of effectiveness. Therefore, the identification and control of risk factors to health, that are modifiable, are fundamental to the prevention of NCD's (Gunawardena et al., 2016).

In South America, the recommendations for physical activity interventions for health promotion, indicate at least 180 minutes a day of physical activity in any intensity (preschoolers) and at least 60 minutes of physical activity, often 3 times per week, with moderate to vigorous intensity in middle and high school (Gonzales, Garcia, Martinez, & Sarmiento, 2016). Despite the recommendations about the intensity of physical activity in the school environment, results show (Costa et al., 2016) that during physical education classes, children (7-11 years) do not reach 50% of moderate or vigorous intensity. To the effectiveness of policies for health promotion in school through physical activity and healthy eating, it is necessary that Governments are encouraged to develop and coordinate teams that guide programs in schools, implement monitoring and evaluation systems, and

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determine goals and objectives for health promotion policies in school to be disseminated and effective (WHO, 2008b).

In Brazil, health promotion in the school environment has as public policy the School Health Program (PSE), established by Presidential Decree No. 6,286, of 5th December of 2007, which integrates the Ministry of Health and the Ministry of Education seeking to enlarge health actions for students of public schools. The PSE must play a fundamental and decisive role on student´s formation, with regard to the construction of citizenship and equity in health care, where the school becomes a loccus for health promotion programs for students of all educational levels (Brasil, 2009).

Despite a public policy aimed at the promotion of school health (PSE), physical activity is far from fulfilling its role with effectiveness results for the improvement of students' health condition at all levels. The PSE must promote the articulation between the State and municipal education secretariats and the unified health system (SUS) subsidizing, planning and integrating the PSE actions, intersectorally integrating health and basic education professionals, for implementation of actions of the program (Ferreira, Moysés, França, Carvalho, & Moysés, 2014)

On the above, it is necessary that health promotion projects in school through physical activity and healthy eating, are implemented on the basis of public policy, coordination between health and education departments and establishment of sustainability strategies for belonging to school and not just mere, but rather permanent interventions. Therefore, the objective of this study is to investigate how a health promotion program from elementary school through physical activity and healthy eating, can be deployed with a view to sustainability and continuity.

METHOD

This research began in August 2013 with diagnostic evaluation and all subjects of the research were reassessed in February 2015, so it is a longitudinal study, the experimental type (groups: experimental and control).

Participants

1098 children of both sexes (♂ = 554/♀ = 544), aged 6 to 10 years, participated in this research, all of them students of municipal public schools (elementary school) of a city in the metropolitan region of Curitiba/PR. Survey respondents belong to two schools, namely: ES-experimental school (n = 592/♂ = 318 | ♀ = 274); CS-control school (n = 506/♂ = 236 | ♀ = 270).

The sample consisted by 100% of the students of both schools. The experimental school was chosen by agreement between the School Board and the research group on Motor Behavior (GECOM/PUCPR), while the control school was indicated by the Municipal Secretary of Education. To ensure that schools do not provide socioeconomic differences, pairing was based on the economic level of the students (p=0.232). The schools are within a distance of 4 Km, ensuring that there was no contamination of the experimental school in control school.

For all students was guaranteed the right to the data confidentiality with the approval of the project in the Committee of Ethics in Research with Humans, the Pontifical Catholic University of Paraná (Protocol 96,321/2012).

Instruments

To assess the economic condition, the questionnaire of the Brazilian Association of Research Companies (ABEP, 2016) was used, which rates the assessed students in A1, A2, B1, B2, C1, C2 and D. For determination of nutritional status were evaluated the measures of weight and height. Date of birth and sex were noted. All data was evaluated using the software WHOANTHRO PLUSS of the World Health Organization. For classification of nutritional status were used the Z score cutting points of body mass index (BMI), from the recommendations of the National System of Food and Nutrition Surveillance (Brasil, 2008).

Evaluation of blood glucose was accomplished with a G-TECH free brand

glucometer, with corresponding reagents tapes. It was adopted the procedure of collecting blood drop pendant with postprandial range (2:00 after the last meal). This procedure was adopted to prevent the assessed student from not fulfilling the 8-hour interval. Therefore, the assessment of blood glucose has always been collected before the school lunch. For classification of glycemia (normal/high) the criteria were the guidelines of the Brazilian Society of Diabetes (SBD, 2016).

The running/walk test of 6 minutes was used to assess and classify the cardiorespiratory capacity, in accordance with the procedures of Sport Brazil Project (Gaya & Gaya, 2016).

The eating habits and consumption of food categories were evaluated with the questionnaire DAFA Typical Day of Physical Activity and Nutrition), validated in 2007 (Barros et al., 2007). This instrument was developed for children as it is based on drawings that represent opportunities for physical activity and nutrition.

Procedures

This survey was initiated in August of 2013, with meetings and authorizations. When the authorization phase was complete, the first data collection (pre-test) was conducted, at the Experimental School (ES) and control School (CS). During the year of 2014 educational interventions were implemented on healthy eating and physical activity. At the beginning of 2015 all students were reevaluated (post-test), using the same instruments and data collection procedures.

Intervention

The intervention during the year 2014 (only in ES) was planned based on values (equity, participation and sustainability) and pillars (autonomy, empowerment, integrity, intersectoral approach and governance) of health promotion (Kusma, Moysés, & Moysés, 2010), as well as the strategies of the document prepared for the WHO workshop on physical activity and public health (WHO, 2005b) which are: awareness, education, conducting programs, skills development, creation of environments propitious to physical activity, give recognition/awards.

During the intervening period were performed the following actions: lectures on healthy eating (Dietitians); informational materials on healthy eating (Dietitians); directed study about food pyramid (nutrition/physical education teacher); Knowledge fair with an emphasis on physical activity and healthy eating (nutrition/school); prohibition of "unhealthy" snacks at school (direction/teachers); construction of the school vegetable garden (parents/students/teachers/direction); increased levels of physical activity during the school physical education classes (physical education teacher); lectures about activity and physical inactivity (Undergraduate teachers in physical education); visits of students to the University to experience different possibilities for physical activity (school/college); Active gaming activities at school (school/college); training of all teachers of physical education of Municipal Education (Secretariat of Education/University); contest and prizes for drawings (students) on the theme "what a healthy family is". All the interventions were supported by the municipal departments of education and health, the direction of the school and of research groups of private and public universities.

Statistical analysis

All variables used for the statistical analysis were nominal and coded for the statistical treatment (ordinals). For the comparison between the CS and ES groups (independent samples) in 2013 and 2015, the Wilcoxon test (Mann-Whitney U) was used. For comparison of the results of the CS group (2013-2015) and ES (2013-2015) the Wilcoxon test (signed rank test) was used. To determine the percentage of occurrence of cases, between 2013 and 2015, cross-reference tables were used. The calculation of the effect size was accomplished using the following equation: value of test/square root of number of subjects (Field, 2009). All statistical procedures were performed with SPSS software 21.0 and Microsoft Excel. The significance level of $p<0.05$ was assumed.

RESULTS

The results found in the comparison between the experimental and control groups (table 1), in the year 2013 (pre-test) showed statistically significant difference only in 3 variables: nutritional status, cardiorespiratory endurance and taste for exercises. In the assessment of nutritional status variables 2015, taste for exercises and fondness for grain were not identified with statistically significant.

The In comparison of the pre and post-test assessments, on experimental school (table 2) there was a decrease of nutritional Status of severe thinness, overweight and obesity. On the other hand, the nutritional state of leanness and severe obesity remained with the same occurrence, while the condition of eutrophy has increased.

Table1

Comparison of health variables between experimental and control group

Variables	*p- value* 2013	*effect size*	*p- value* 2015	*effect size*
Nutritional Status	0.008	0.11	0.174	0.05
Blood glucose	0.806	0.01	0.000	0.26
Cardiorespiratory endurance	0.000	0.32	0.005	0.10
Fondness for exercises	0.000001	0.21	0.588	0.02
Fondness for Fruits	0.496	0.02	0.001	0.12
Fondness for soft drinks	0.086	0.07	0.003	0.11
Fondness for grain	0.348	0.04	0.267	0.04
Fondness for Vegetables	0.924	0.03	0.001	0.13

Table 2

Comparison of variables between pre and post-test in the experimental group

Variables	Classification	% 2013	%2015	*p*	effect size
Nutritional Status	Severe thinness	1.4	0.3	0.346	0.05
	Thinness	2	2		
	Eutrophic	66.3	74.1		
	Overweight	18	12.9		
	Obesity	9.2	7.5		
	Severe obesity	3.1	3.1		
Blood glucose	Normal	66.2	99.3	0.000	0.57
	High	33.8	0.7		
Cardiorespiratory endurance	Risk zone	72.2	54.6	0.000	0.24
	Healthy zone	27.8	45.4		
Fondness for exercises	Don't like	0.3	0.7	0.001	0.19
	Like a little	3	0.3		
	Like	8.4	2		
	Really like	18.6	18.9		
	Adore	69.6	78		
Fondness for Fruits	Don't like	0.3	2	0.353	0.05
	Like a little	0.3	1		
	Like	5.1	4.7		
	Really like	13.5	13.2		
	Adore	80.7	79.1		
Fondness for soft drinks	Don't like	4.4	8.2	0.021	0.13
	Like a little	4.1	5.4		
	Like	8.8	10.2		
	Really like	18.4	19		
	Adore	64.3	57.1		
Fondness for grain	Don't like	4.7	4.7	0.761	0.017
	Like a little	1.4	2		
	Like	8.5	5.8		
	Really like	13.6	14.2		
	Adore	71.9	73.2		
Fondness for Vegetables	Don't like	16	16	0.040	0.11
	Like a little	9.5	5.8		
	Like	10.2	6.8		
	Really like	19.7	12.6		
	Adore	44.6	58.8		

In spite of the differences found, a statistically significant difference between the two evaluations has not been identified. The blood glucose and cardiorespiratory endurance variables present significant difference between the assessments, with best results after the intervention. When it comes to the fondness for exercises, the greatest difference was identified in the "I adore exercise" (p=0.001). In the matter of fondness for soft drinks, "don't like" increased and "like" dropped in comparison between 2013 and 2015. In the matter of fondness for grains, a statistically significant difference hasn't been identified. In the matter of the fondness for vegetables, the most important increase was related to "like". In the results of the CS group (table 3), it was identified a statistically significant difference in blood glucose, with decreased normal blood glucose cases and an increase in cases of high blood glucose. In the item fondness for fruit, there has been an increase in "like" at the same it was identified a decrease in "really like" (p=0.021). Another difference was identified in the fondness for vegetables with an increase in "like", but with decreased "really like" and "like" (p = 0.040).

Table 3
Pre and post control group variables comparison

Variables	Classification	% 2013	%2015	*p*	effect size
Nutritional Status	Severe thinness	4.7	0.8	0.909	0.007
	Thinness	6.3	2.4		
	Eutrophic	63.2	77.5		
	Overweight	15.4	12.6		
	Obesity	6.3	4		
	Severe obesity	4	2.8		
Blood glucose	Normal	88.1	65.2	0.000	0.36
	High	11.9	34.8		
Cardiorespiratory endurance	Risk zone	45.2	40.1'	0.267	0.07
	Healthy zone	54.8	59.9		
Fondness for exercises	Don't like	1.6	0.8	0.354	0.058
	Like a little	1.6	0.8		
	Like	0.8	1.6		
	Really like	11.5	9.9		
	Adore	84.6	87		
Fondness for Fruits	Don't like	1.6	0.8	0.030	0.13
	Like a little	0	0.4		
	Like	3.2	2		
	Really like	12.3	5.5		
	Adore	83	91.3		
Fondness for soft drinks	Don't like	2	6.8	0.079	0.11
	Like a little	1.2	2.8		
	Like	14.7	10.8		
	Really like	10	14.7		
	Adore	72.1	64.9		
Fondness for grain	Don't like	4	4.3	0.022	0.14
	Like a little	0.8	3.6		
	Like	4	7.5		
	Really like	14.6	16.6		
	Adore	76.7	68		
Fondness for Vegetables	Don't like	5.9	18.6	0.060	0.11
	Like a little	9.9	5.1		
	Like	39.1	11.9		
	Really like	17	13		
	Adore	28.1	51.4		

DISCUSSION

The results found in the comparison between the experimental and control groups (table 1), in the year 2013 (pre-test) showed statistically significant difference only in 3 variables: nutritional status, cardiorespiratory endurance and fondness for exercises. In the assessment of nutritional status variables in 2015, fondness for exercises and fondness for grain were not identified with statistically significant difference.

It must be taken into consideration that the differences found between the groups (table 1), in 2013 evaluation (pre-test) and 2015 (post-test), are relatively consistent and expected, because interventions addressed to children, based on healthy eating and physical activity, have a great impact on the health of schoolchildren. Behavioral and environmental changes, as much at school as in the family, too, can be effective when focused on educational processes for health promotion (Myers et al., 2014). It should be noted that changes can only be achieved with long periods of intervention time (Adab et al., 2015), that is, before the intervention proposed by this research, we did not have access to which kind of activities were carried out and what kind of obesogenic factors the children were exposed to.

The results found in the comparison of the results obtained in the CS group, between 2013 and 2015 (table 2) showed no major changes, once they were not exposed to the intervention actions. In this sense, the implementation of programs focused on health promotion must be genuinely effective, with the participation of the community and reinforced by public policies that are addressed to this goal (Haggis, Sims-Gould, Winters, Gutteridge, & McKay, 2013).

Based on all of the actions developed in the year 2014, on experimental school, there was a highly positive impact with regard to changes in behavior and diagnosed. Intervention programs implemented in the school environment, with eating education and increased levels of physical activity, in partnership with organizations (departments of health and education) guarantee the sustainability of the initiative and increase the empowerment on nutrition and possible impacts on obesity, mainly in childhood (Madsen et al., 2015).

Fortunately, planned actions based on public policy, as the PSE and in guiding principles of health promotion tend to generate positive impacts in terms of school health. Active health education, with the increase of the possibilities of participation of children in physical activities and the development of skills for healthy decision-making in homelike increase the consistency and sustainability of interventions focused on health at school (Haggis et al., 2013).

Obviously, not all actions of health promotion in the school environment are effective and/or hold up, as the program "The Active for Life Year 5" (AFLY5) (Kipping et al., 2014) which found evidences that, in order to increase levels of physical activity, the training of teachers is not effective. Therefore, the implementation of intervention programs to increase levels of physical activity and healthy eating at school should be planned, evaluated and controlled to have assurance of effectiveness.

In this research, following the actions and curricular content of physical education may have caused undesirable effects and/or interfered in the results. Therefore, the control of the contents of the school physical education should be agreed with the proponents of the deployment of an intervention project.

CONCLUSION

Based on the implementation of a school-based health promotion program, with physical activity and healthy eating, it can be concluded that it is possible, sustainable and viable to keep constant actions in the school environment, aiming the education of healthy habits, reinforcing pillars of health promotion, as the health care equity. The implementation and sustainability of a program for health promotion in school, should be articulated in an intersectorial way, involving managers of the health and education sectors, the community (students, parents, teachers and the school

direction) in which all can actively and consensually participate in the process.

The results demonstrate that long-term interventions promote positive and significant changes in the profile of school health indicators. They also change behaviors from the empowerment, not only of students as that of managers and parents. Therefore, to follow the recommendations of the Health Organization, values and pillars of health promotion, proposed by collective health, to implement actions aimed to health promotion, result in consistent changes in the current scenario of health at school.

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REFERENCES

ABEP. Associação Brasileira de Empresas de Pesquisa. (2016). Questionário para avaliação de condição sócioeconômica. Retrieved September 22, 2016, from http://www.abep.org

Adab, P., Pallan, M. J., Lancashire, E. R., Hemming, K., Frew, E., Griffin, T., … Cheng, K. K. (2015). A cluster-randomised controlled trial to assess the effectiveness and cost-effectiveness of a childhood obesity prevention programme delivered through schools, targeting 6-7 year old children: the WAVES study protocol. *BMC Public Health*, *15*(1), 488. doi: 10.1186/s12889-015-1800-8

Barros, M. V. G., Assis, M. A. A., Pires, M. C., Grossemann, S., Vasconcelos, F. De A. G. de, Luna, M. E. P., & Barros, S. S. H. (2007). Validação de um questionário de atividade física e consumo alimentar para crianças de sete a dez anos de idade. *Revista Brasileira Saúde Materna Infantil 7*(*4*), 437–448. doi: 10.1590/S1519-38292007000400011

Brasil, M. D. S. (2009). *Cadernos de Atenção Básica - Saúde na Escola*. *saúde na escola*. Brasília, BRASIL: Ministério da Saúde. Retrieved from http://dab.saude.gov.br/docs/publicacoes/cadernos_ab/abcad24.pdf.

Costa, B. G. G. da, Silva, K. S. da, Hino, A. A. F., Leal, D. B., Gripa, L. T., & Assis, M. A. A. de. (2016). Context and Intensity of Primary School Physical Education Classes in Brazilian Schoolchildren. *Mathews Journal of Pediatrics*, *1*(1), 2–7.

Ferreira, I. do R., Moysés, S. J., França, B. H. S., Carvalho, M. L. de, & Moysés, S. T. (2014). Percepções de gestores locais sobre a intersetorialidade no Programa Saúde na Escola. *Revista Brasileira de Educação*, *19*(56), 61–76. Retrieved from http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1413-24782014000100004&lang=pt

Field, A. (2009). *Descobrindo a estatistica usando o SPSS-2* (2ª Ed.). Porto Alegre: Artmed.

Gaya, A., & Gaya, A. (2016). *Projeto esporte Brasil: manual de testes e avaliação*. (URGS, Ed.) (1ª ed.). Porto Alegre: URGS. Retrieved September 23, 2016, from https://www.ufrgs.br/proesp/arquivos/manual-proesp-br-2015.pdf

Gonzales, S. A., Garcia, J., Martinez, A., & Sarmiento, O. L. (2016). *2º Reporte de clificaciones en actividad física en niños y adolescentes*. *Universidad de los Andes*. Bogotá: Universidad de los Andes.

Gunawardena, N., Kurotani, K., Indrawansa, S., Nonaka, D., Mizoue, T., & Samarasinghe, D. (2016). School-based intervention to enable school children to act as change agents on weight, physical activity and diet of their mothers: a cluster randomized controlled trial. *The International Journal of Behavioral Nutrition and Physical Activity*, *13*, 45. doi: 10.1186/s12966-016-0369-7

Haggis, C., Sims-Gould, J., Winters, M., Gutteridge, K., & McKay, H. A. (2013). Sustained impact of community-based physical activity interventions: key elements for success. *BMC Public Health*, *13*(1), 892. doi: 10.1186/1471-2458-13-892

Kipping, R. R., Howe, L. D., Jago, R., Campbell, R., Wells, S., Chittleborough, C. R., … Lowlor, D. A. (2014). Effect of intervention aimed at increasing physical activity, reducing sedentary behaviour, and increasing fruit and vegetable consumption in children: Active for Life Year 5 (AFLY5) school based cluster randomised controlled trial. *BMJ*, *348*(May), g3256. doi: 10.1136/bmj.g3256

Kusma, S. Z., Moysés, S. T., & Moysés, S. J. (2010). Promoção da saúde : perspectivas avaliativas para a saúde bucal na atenção primária em saúde. *Ciencia e Saude Coletiva*, *15*(1), 269–276. doi: 10.1590/S0102-311X2012001300003

Madsen, K., Linchey, J., Gerstein, D., Ross, M., Myers, E., Brown, K., & Crawford, P. (2015). Energy balance 4 kids with play: Results from a two-year cluster-randomized trial. *Childhood Obesity*, *11*(4), 375–383. doi: 10.1089/chi.2015.0002

Metcalf, B., Henley, W., & Wikin, T. (2012). Effectiveness of intervention on physical activity of children: Systematic review and meta-

analysis of controlled trials with objectively measured outcomes (EarlyBird 54). *BMJ*, *345*(7876), no pagination-no pagination. doi: 10.1136/bmj.e5888

Brasil. (2008). Protocolos do Sistema de Vigilância Alimentar e Nutricional - SISVAN na assistência à saúde. *Brasilia: Ministério da Saúde.*

Myers, E. F., Gerstein, D. E., Foster, J., Ross, M., Brown, K., Kennedy, E., … Crawford, P. B. (2014). Energy Balance for Kids with Play: Design and Implementation of a Multi-Component School-Based Obesity Prevention Program. *Childhood Obesity*, *10*(*3*), 251–259. doi: 10.1089/chi.2013.0075

Brazilian Society of Diabetes [SBD]. (2016). *Diretrizes da Sociedade Brasileira de Diabetes|2015-2016*. *Diabetes Mellitus Tipo 1 E Tipo2* (1ª ed., Vol. *5*). São Paulo: A.C. Farmacêutica. doi: 10.1590/S0102-311X2003000700004

World Health Organization [WHO]. (2005a). *Preventing Chronic Diseases: a vital investment*. *World Health Organization*. Geneva.

World Health Organization [WHO]. (2005b). *Review of Best Practice in Interventions to Promote Physical Activity in Developing Countries: Background Document prepared for the WHO Workshop on Physical Activity and Public Health*. *World Health Organization*. Beijing.

World Health Organization [WHO]. (2008a). *Preventing Noncommunicable Diseases in the Workplace through Diet and Physical Activity/World Economic Forun Report of a Joint Event*. *World Health Organization*. Geneva.

World Health Organization [WHO]. (2008b). School Policy framework: implemantation of the who global strategy on diet, physical activity and health. *World Health Organization*. Geneva.

World Health Organization [WHO]. (2009). Interventions on diet and physical activity: what works/methodology. *World Health Organization*. Geneva.

World Health Organization [WHO]. (2016). Ending Childhood Obesity. *World Health Organization*. Geneva.