JACOBS PUBLISHERS

OPEN ACCESS

Jacobs Journal of Physiotherapy and Exercise

Research Article

A Targeted Physical Activity Intervention for Parents and Their 8-9 Year Old Children: The Project "Togetherfit"

Ellen Ricke[1*], Barend J.C. Middelkoop[2], Geertje A.M. Ariëns[3], Han C.G. Kemper[4]

[1]*Public Health Service The Hague NL*

[2]*Dept. of Public Health and Primary Care LUMC & Public Health Service The Hague NL*

[3]*Public Health Service The Hague NL*

[4]*VU University Medical Center EMGO+ Institute for Health and Care Research Amsterdam NL*

**Corresponding author: Dr. Ellen Ricke, Westeinde 128, 2512 HE The Hague, The Netherlands, Tel: (+31)621181702; Email: e.ricke@live.nl*

Received: 08-03-2015

Accepted: 08-19-2015

Published: 10-06-2015

Abstract

Background: Since children are becoming less physically active, the main goal of this research was to determine if a three-month intervention ("TogetherFit") could influence parents' stage of change and the physical activity behavior of their children.

Methods: Parents (n = 34: n = 16 intervention group, n = 18 control group) of two school classes of fifth grade of an elementary school completed a questionnaire at baseline (T0), immediately after the intervention (T1) and three months later (T2) to measure their stage of change. The physical activity behavior of their children (n = 34: n = 16 for the intervention group, n = 18 for the control group) was measured at the same time with pedometers. Only participants who provided complete data (stages of change and physical activity behavior at T0, T1 and T2) were used for analysis (n = 27: n = 15 for the intervention group, n = 12 for the control group).

Results: At T1, 67% of the parents in the intervention group had a positive result in their stage of change against only 8% for the parents in the control group. These results were nearly the same at T2. The physical activity behavior of the children in the intervention group increased significantly compared to the control group. The change in pedometer counts of the children over time was significantly different between the intervention group and the control group.

Conclusions: The results indicate the potential for the intervention "TogetherFit" to make a significant positive impact.

Keywords: Parental influence; Children's Physical Activity; Interventions; Socioeconomic Status; Ethnicity

Introduction

Physical activity is defined as any bodily movement by skeletal muscles resulting in energy expenditure [1]. Physical activity is associated with an increased life expectancy and a decreased risk of cardiovascular diseases, obesity, hypertension, diabetes, depression and osteoporosis [1]. Unfortunately, sedentary behaviors such as computer use, television viewing and playing video games, consume children's leisure time and adversely impact physical activity levels to the point of inactivity [1]. So it is important that children should be motivated to be physically active. In addition it is known that children who engage in physical activity during childhood and adolescence are likely to be physically active adults, they have learned the importance of healthy behaviors throughout life [2]. Parents play an important role in motivation and socialization because of their physical activity-related behaviors [3-7]. In addition to parental influences, peer pressure and other role models (for example, professional athletes) may also influence the physical activity behaviour of children and adolescents. Peer influences on the physical activity behaviour of adolescents may actually replace the substantial parental influences observed in younger children [8].

Family is often seen as the most important reference point from which to understand individuals' physical activity behavior and attitudes [9]. Parents may exert significant social influence over their children's physical activity through a variety of mechanisms ranging from encouragement, support, role modeling (indirect effects) and transportation to sports clubs and competitions (direct effects) [3,5,10,11]. From these, parental encouragement (an indicator of social influence) and parental facilitation (an indicator of social support) are the most powerful mediators for the physical activity behavior of their children [12]. These mediators are even more powerful than role modeling, where children directly model their parent's behavior. The effect of role modeling seems to reflect the differences in encouragement and support that are provided by active and inactive parents [12]. Active parents are more supportive and involved in their children's physical activity behavior [9, 12]. The Social Cognitive Theory (SCT) can explain why a parent's attitude towards physical activity is related to their children's physical activity behavior. According to SCT, individuals learn behaviors by observing the behaviors of others. But more importantly, SCT also describes that a supportive environment is necessary for establishing and maintaining positive health behaviors [13]. Accordingly, parents have the capacity to influence their children's participation in physical activity by providing the appropriate support such as encouragement and facilitation [14]. With the appropriate support, they can create self-esteem in their children and consequently improve their children's motivation and behavior towards physical activity [15,16].

The previous paragraph explains that a parent's attitude towards physical activity can be a motivator for their children's physical activity behavior. To motivate their children to be physically active, parents first need to have a positive attitude towards physical activity themselves. So they may have to change their current attitude towards physical activity. The Trans Theoretical Model of behavior change (TTM) [17] can be consulted for further information on the attitude and beliefs of parents towards physical activity. TTM assesses an individual's readiness to act on a new healthier behavior, and provides strategies, or processes of change to guide the individual through the stages of change to action and maintenance of the new behavior [17]. The model can describe in which stage of change a parent is and may also predict, based on the stage of change, whether or not a parent will be able to motivate his/her child to become physically active. The TTM distinguishes five stages of change that categorize the transition from "unwilling to change" to "retention of desired behavior" [17]. Change is viewed as a progression from an initial precontemplation stage (not considering change), to contemplation (thinking about making a change), and then to preparation (intending to make a change). Successful accomplishment of the initial stages leads to taking action (making the change) and if successful, this action can lead to the fifth stage of change, maintenance (maintaining the change) [17]. As an example, a parent in precontemplation stage does not know about the health effects of physical activity, or does not think it is important enough to be physically active. Such a parent cannot stimulate his/her child to become physically active because of his/her own inappropriate attitude/beliefs towards physical activity, his/her lack of knowledge about physical activity and/or less opportunity to be physically active. Because a parent's attitude towards physical activity can positively contribute to the physical activity behavior of the child, this research will examine if it is possible for an intervention to change parents' behaviour, i.e. change both the parents' stage of change and the children's physical activity behavior.

This research aims to answer the following questions: (1) Does the intervention "TogetherFit" positively influence parent's stage of change? (2) Does the intervention "TogetherFit" positively influence children's physical activity behavior?

Materials and Methods

Study design and participants

"TogetherFit" was carried out with parents and their children (intervention group). The name "TogetherFit" refers to the activity of getting fit together (both parents and children).

Data collection and analysis was conducted between August 2011 and February 2012, so a declining trend of physical activity was expected due to seasonal effects; the weather accounts for as much as 42% of variance in measured physical activity [18]. To estimate seasonal effects, a second group of parents

and their children, not receiving the intervention, participated in this study (the control group).

An elementary school in The Hague, the Netherlands, with two grade 5 classes was approached to participate in this research, one receiving the intervention, the other not (determined by the school principal). Grade 5 classes were chosen, because studies have indicated that at this age (8-9 years) children move less, and positive results can be reached with the help of interventions [19]. This school was chosen because almost all the children are from ethnic minority groups (mostly Turkish and Moroccan) and their parents have a low socioeconomic status. Both variables are associated with insufficient levels of physical activity in children [20], so at this school an effective intervention was desirable.

Both parents (n = 35) and children (n = 35) were asked for their written informed consent for participation in this study. Only those children who gave consent themselves as well as their parents were invited on to the research. One child was not allowed to participate. In total, 34 parents (16 in the intervention group, 18 in the control group) and 34 children (16 in the intervention group, 18 in the control group) participated. All children were 8-9 years old and the mean age of the parents was 38.3 years. One parent could participate with each child.

The main goal of this research was to examine if the intervention "TogetherFit" had an influence on the stage of change of the parents and on the physical activity behavior of their children. The primary outcomes are change of stage of change of the parents and pedometer counts of the children.

Description "TogetherFit"

The intervention "TogetherFit" is based on the Trans Theoretical Model (change in stage of change) and the Social Cognitive Theory (a behavior change of the parents will make it possible to positively influence the physical activity behavior of their children).

The intervention consists of three parts: (1) information for the parents about nutrition, education and physical activity, (2) physical education classes for children and their parents and (3) motivational interviewing of parents.

The information sessions for the parents consist of three sessions over three months and cover physical activity, nutrition and education. Every subject is explained in a separate chapter in a brochure, which the parents received at the first session. Each session took 30 minutes. The brochure gave the parents information and examples of where they could be active in their neighborhood and how they could motivate their child. The researcher, who conducted the information sessions, explained during the first session the importance of physical activity, what the benefits are and how to implement them in daily life. After this session, parents were invited to participate in their children's physical education class. By participating in this class, parents gained an insight into what their children learned about physical activity and which physical activities they could do together with their children. Being physically active together was intended to motivate both parents and children. The same sessions were held by the researcher at intervals of one month for a total of three sessions. At each session another chapter of the brochure was discussed with the parents followed by a physical education class for both parents and children, conducted at the school (taught by the children's physical education teacher). The intervals of one month enabled the parents to practice what they had learned and gave them time to change their attitude and beliefs towards physical activity.

The researcher supported the parents in making changes in their attitude and beliefs by using motivational interviewing (MI); a way of counseling that can be applied in the initial stage of the process of change [17]. A counseling session lasted one hour. In the first month of the intervention the researcher used MI with each parent in a location chosen by the parent. The questions asked in the interview depended on the stage of change of the parent. The answer score was the base of the subsequent question. For example, "On a scale from one to ten, with ten being the highest, assuming you want to motivate your child to get active, how sure are you that you are able to do that?" When the answer was five, then the parent was asked why they did not select a lower grade, such as three or four. The parent was then asked what they needed in order to reach a six or seven.

MI revealed that parents gave higher priority to their children´s academic performance at school than their physical activity and health, as during MI more emphasis was laid on the influence of physical activity on school performance and personal development than on health (health as a means for better school results).

Training of grade 5 teachers and physical education teacher

The researcher trained the three teachers. They received a "TogetherFit" teacher's guide that contained complete information about the intervention and the materials (e.g. stage of change questionnaire, protocols on how to administer the questionnaire and how to work with pedometers, examples of physical education lessons for parents and children together).

Measurements

All measurements (stage of change and physical activity behavior) were conducted at baseline (T0), immediately after the intervention (T1) and three months later (T2).

Stage of change

Two weeks before the start of the intervention, parents (in

both the intervention and the control group) received a questionnaire from their children's teacher to assess their current stage of change. Parents were allowed to fill in the questionnaire at school (with help of the teacher if necessary) or at home and return it a day later. They were motivated to fill in the questionnaire with the offer of a ticket for a free swim in a swimming pool of their choice if they returned the questionnaire. The Physician-based Assessment and Counseling for Exercise (PACE) questionnaire was used because it matches with the stages of change of the Trans Theoretical Model [21]. The questionnaire categorizes the parents, through 11 statements about physical activity, into one of three groups based on a simplified stage model: precontemplation, contemplation and action. A simplified model of the TTM was appropriate for this study because the aim of "TogetherFit" was to bring parents from no action to action (what is indicated by the three stages of this simplified stage model). Process evaluation of the PACE intervention confirms the use of the simplified stage model [22]. This procedure was repeated at all three points of measurement, both for the intervention group and the control group.

Physical activity behavior

Immediately following receipt of the completed questionnaire, the children (in both the intervention and the control group) were asked to wear a sealed pedometer (Yamax SW200) for three weekdays to measure their physical activity behavior. The researcher instructed the children, in the presence of their parents and their teacher, in order to enable parents and teachers to supervise the use of the pedometer. A number of studies have documented marked differences in weekday and weekend physical activity behavior [23-25], so the instruction was to wear the pedometer during weekdays, which is sufficient to determine habitual physical activity levels in children [25-27]. A Yamax SW200 was chosen, which is the most reliable pedometer both in laboratory settings and in daily use [6,28-30]. Teachers handed these out to be worn on the right hip, both in the intervention and the control group. Data was collected anonymously, but could be linked to the parent's questionnaire by a common key number. In the analyses, the pedometer counts were used as the mean of three days.

Statistical analysis

The Chi-square test was used to determine the changes in the stages of change over time [31]. To determine the effect of the intervention two categories were defined: 1. "positive result" (progression of one or more stages of change or remaining in action stage) and 2."negative result" (regression of stages of change or remaining in precontemplation/contemplation stage). These categories were defined twice: based on the change from T0 to T1 and the change from T0 to T2.

The Chi-square test was performed two times. First to determine if there was a significant difference between the control and the intervention group with respect to the change in stage of change at the end of the intervention (T0-T1), and second, to determine if there was still a significant difference in the change of stage of change between the control and the intervention group three months later (T0-T2).

To compare the children's physical activity behavior at the different time-points, a repeated measure ANOVA was used, with group (intervention- or control group) as the between variable and time (T0, T1 and T2) as the within variable. Linear contrasts were used to follow-up on interactions [31]. The interaction was examined to determine if the intervention group was significantly more active than the control group after each measurement. This was done by three separate independent *t*-tests [31].

In all tests, a p-value < .05 was considered as a significant difference.

Results

Only participants who provided complete data (stages of change and physical activity behavior at T0, T1 and T2) were used for analysis. Seven parents and their children were removed from the analysis because of missing data. In total, full data sets were available from 15 parents and their children in the intervention group and 12 in the control group.

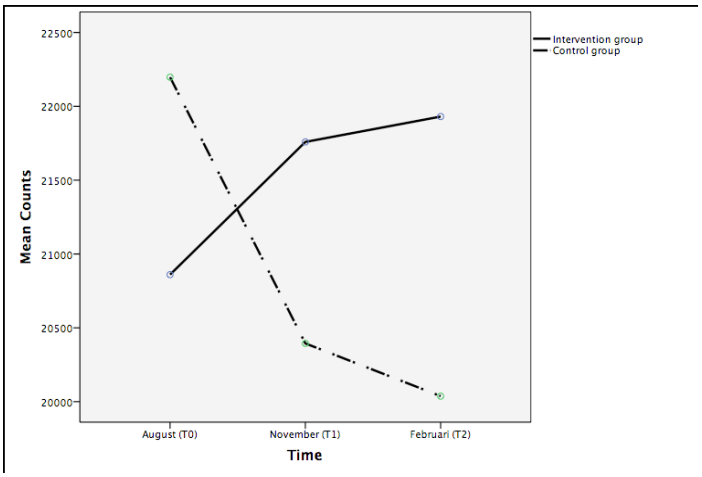

Figure 1. Mean counts of pedometer steps for the intervention and control group over time.

At T0, 47% of the intervention group parents were in precontemplation, 33% in contemplation and 20% in the action phase. For the control group, this was 42%, 33% and 25% respectively, i.e. not significantly different from the intervention group (table 1). With respect to the pedometer counts of the children, the control group had more mean counts at baseline (figure 1) but the difference was not significant.

Table 1. Descriptive statistics for parents with valid stages of change data.

	Baseline measurement (T0)		**First post-intervention measurement (T1)**		**Second post-intervention measurement (T2)**	
	Intervention group (n = 15)	Control group (n = 12)	Intervention group (n = 15)	Control group (n = 12)	Intervention group (n = 15)	Control group (n = 12)
	n (%)	*n (%)*	*n (%)*	*n (%)*	*n (%)*	*n (%)*
Parents						
Father	3 (20)	1 (9)	3 (20)	1 (9)	3 (20)	1 (9)
Mother	12 (80)	11 (91)	12 (80)	11 (91)	12 (80)	11 (91)
Child						
Boy	8 (53)	7 (58)	8 (53)	7 (58)	8 (53)	7 (58)
Girl	7 (47)	5 (42)	7 (47)	5 (42)	7 (47)	5 (42)
Stage of change						
Precontemplation	7 (47)	5 (42)	4 (27)	10 (83)	3 (20)	10 (83)
Contemplation	5 (33)	4 (33)	1 (7)	1 (8)	3 (20)	0 (0)
Action	3 (20)	3 (25)	10 (67)	1 (8)	9 (60)	2 (17)

Table 2. Change in behavior of parents (change in stage of change) and children (change in pedometer counts over time) and effect of the intervention.

	From baseline to first post-intervention measurement (T0-T1)			**From baseline to second post-intervention measurement (T0-T2)**		
	I (n=15)	C (n=12)	*p*	I (n=15)	C (n=12)	*p*
	n (%)	*n* (%)		*n* (%)	*n* (%)	
Change in stage of change						
Positive result	10 (67)	1 (8)	.00*	11 (73)	2 (17)	.00*
Negative result	5 (33)	11 (92)		4 (27)	10 (83)	
Change in pedometer counts over time						
Mean change in counts over three days ± SD	899 ± 1881	-1803 ± 2199	.00**	1070 ± 2240	-2160 ± 2410	.00**

I = intervention group
C = control group
*χ^2-test
**t-test

Intervention effects

Stages of change

At T1, the number of parents in the intervention group who experienced a positive change in their attitude is significantly higher than in the control group (67% of the parents in the intervention group versus 8% in the control group; table 2).

At T2, the overall picture is the same as at T1; the number of parents in the intervention group experiencing a positive change in their attitude remains significantly higher than in the control group (table 2).

Physical activity behavior

A repeated measure ANOVA was used to determine whether the intervention introduced a significant change in the physical activity of children over time (figure 1). A significant interaction was found for group (intervention- or control group) by time (T0, T1 and T2) (F = 11.2, p < 0.00). This suggests, that the differences between groups, in change in counts on the pedometer at each time-point, were significant. Figure 1 shows that as children progress through time from T0-T2, children of the intervention group increasingly out-performed the children of the control group. To determine if the intervention group was significantly more physically active than the control group after each measurement, separate independent t-tests were performed. The change in counts on the pedometer was significantly different, in favor of the intervention group (T0 versus T1 as well as T0 versus T2: table 2).

Discussion

Stage of change of the parents

The first goal of this research was to determine if it is possible for the intervention "TogetherFit" to influence parents' stage of change with respect to their attitude towards physical activity. The results of the research show that the project "TogetherFit" is able to do this. In addition, the results are not only significant, but also relevant. It is well known that it is difficult for behavior/attitude change interventions to have long-lasting effects. But this research demonstrated that "TogetherFit" has a positive effect even at T2. According to the Trans Theoretical Model, behavior change is a process and not an event. Once the new behavior is practiced for at least six months, one is able to maintain the behavior [17]. To prevent a relapse in the first six months, literature recommends that there is a follow-up intervention for parents after the initial intervention, with longer follow-up intervals [17]. Future studies should take this into account.

A striking result is the decline in scores of stage of change in the control group at T1 (table 1). An explanation could be the fact that parents were motivated by the enthusiastic invitation of the teacher at T0, so they answered the questionnaire to positive at T0 (is in accordance with the pedometer counts of the children in the control group; also high score at T0). Future research could take this into account by making the intervention period longer (T3) and analyze data from T1-T3.

"TogetherFit" is a complex intervention, consisting of different elements so it is not clear what element makes the intervention effective. However, motivational interviewing (MI) seems to be an important aspect for change in stage of change of the parents. The advantage of MI is that it addresses individual, ethnic, social and economic situations [32]. It assumes that a behavior change is more influenced by motivation than by information and gives parents strategies to bring them from no action to action [33]. Through individual sessions from the researcher with the parents, it became clear what each parent needed to accomplish behavior change. The researcher could adapt to these needs, so every single parent was able to make progress in his/her stage of change in a way that best suited him/her. This is in accordance with previous research, which states that it is important to determine parents' stage of change with respect to their attitude towards physical activity [34]. In this way it is possible to discuss what parents are currently doing, what barriers they experience with respect to behavior change and develop targeted strategies to increase in stage of change over time [34].

As mentioned before, the intervention "TogetherFit" focuses on parents in precontemplation and contemplation stage. Parents in action stage were also included in the analysis of the results of this research. When excluding parents in action stage at T0, results remain the same (results not shown in results section).

Physical activity behavior of the children

With respect to physical activity behavior, this research examined whether the intervention "TogetherFit" could make children more physically active. Results show a significant change in the intervention group; children are more physically active after the intervention, than before. Also, the results show that the change in pedometer counts of the children over time was significantly different between the intervention group and the control group. Over time, the change in pedometer counts in the intervention group stayed stable from T1 to T2; the intervention "TogetherFit" makes it possible to prevent a decline in pedometer counts in the intervention group which occurred in the control group, probably due to a seasonal effect (figure 1). November (T1), a cold and rainy month, discouraged children from playing outside and may have caused the decline in steps in the control group. This was prevented in the intervention group by "TogetherFit". The parental brochure "To-

getherFit" discussed ways to be physically active irrespective of the weather condition. Examples were given for activities that children (and their parents) could do in their house or in community centers in their neighborhood.

The results were not only significant but also relevant. As mentioned in the methods section, the weather accounts for as much as 42% of variance in measured physical activity [18]. The intervention "TogetherFit" was able to compensate for this variance in the intervention group and motivated children to be physically active.

A limitation is the use of pedometers: they do not measure all types of physical activity, e.g. cycling, swimming and skating (popular sports amongst Dutch children). Pedometers register movements in vertical direction: when the pedometer is placed on the right hip, it measures the vertical movement of the body center of gravity. For a more accurate measurement of physical activity, it is recommended to use accelerometers [26]. Another limitation is the fact that the drop out in the control group is much higher than in the intervention group (33.3% in the control group vs. 6.3% in the intervention group). This may have changed the results.

This research shows positive results for both parents and children. With respect to future research, it would be interesting to see if there is a relation between the change in stage of change of the parents and the physical activity behavior of their children; i.e. when parents make a positive change in their stage of change, does this change make their children more physically active.

Conclusion

In summary, this research has demonstrated the potential of the intervention "TogetherFit" for making an improvement in the stage of change of parents and in the physical activity behavior of children.

Despite small numbers of participants, the study resulted in a significant and relevant change in the stage of change of parents in the intervention group and in a significant and relevant change in the physical activity behavior of their children. This intervention, which involved the cooperation of parents, children and teachers, was feasible. "TogetherFit" deserves a larger study, with more participants and a follow-up for parents after the initial intervention with longer follow-up intervals.

References

1. Pate PR, Pratt M, Blair SN, Haskell WL, Macera CA et al. Physical Activity and Public Health – A Recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. JAMA. 1995, 273(5): 402-407.

2. Schneider H, Lounsbery M. Setting the stage for lifetime physical activity in early childhood. Journal of Physical Education, Recreation & Dance. 2008, 79(6): 19-23.

3. Hoyle RH, Leff SS. The Role of Parental Involvement in Youth Sport Participation and Performance. Adolescence. 1997, 32(125): 233-243.

4. Kohnstamm R. [*Small Developmental psychology I*]. Houten/Diegem: Bohn Stafleu Van Loghum, 2002. Dutch.

5. O'Connor TM, Jago R, Baranowski T. Engaging Parents to Increase Youth Physical Activity: A Systematic Review. Am J Prev Med. 2009, 37(2): 141-149.

6. Schneider PL, Crouter SE, Lukajic O, Bassett DR. Accuracy and reliability of 10 pedometers for measuring steps over a 400-m walk. Med Sci Sports Exerc. 2003, 35(10): 1779-1784.

7. Ullrich-French S, Smith AL. Social and motivational predictors of continued youth sport participation. Psychol Sport Exerc. 2009, 10(1): 87-95.

8. Kohl HW, Hobbs KE. Development of physical activity behaviors among children and adolescents. Pediatrics. 1998, 101(3 pt 2): 549-554.

9. Brustad RJ. The role of family in promoting physical activity. The President's Council of Physical Fitness and Sports: Research Digest. 2010, 10(3): 1-8.

10. Desforges C. The impact of parental involvement, parental support and family education on pupil achievements and adjustment: A literature review. London: Department for Education and Skills, 2003.

11. Edwardson CL, Gorely T. Parental influences on different types and intensities of physical activity in youth: A systematic review. Psychol Sport Exerc. 2010, 11(6): 522-535.

12. Welk GJ, Wood K, Morss G. Parental influences on physical activity in children: an exploration of potential mechanisms. Pediatr Exerc Sci. 2003, 15: 19-33.

13. Bandura A. Social Learning Theory. Englewood Cliffs: Prentice-Hall, 1977.

14. Trost SG, Loprinzi PD. Parental influences on physical activity behavior in children and adolescents: a brief review. Am J Lifestyle Med. 2011, 5(2): 171-181.

15. Bois JE, Sarrazin PG, Brustad RJ, Trouilloud DO, Cury F. Elementary schoolchildren's perceived competence and physical activity involvement: the influence of parent's role modeling behaviours and perceptions of their child's competence. Psychol Sport Exerc. 2005, 6(4): 381-397.

16. Eccles JS, Wigfield A, Schiefele U. Motivation to succeed. In Damon W, Eisenberg N. Handbook of child psychology: Vol. 3 Social, emotional and personality development. New York: Wiley, 1998.

17. DiClemente CC, Velasquez MM. Motivational Interviewing and the Stages of Change. In: Miller WR, Rollnick S. Motivational Interviewing. Preparing people for change. New York: The Guilford Press, 2002.

18. Tucker P, Gilliland J. The effect of season and weather on physical activity: A systematic review. Public Health. 2007, 121(12): 909-922.

19. Rowland TW. Physical activity, fitness, and children. In Bouchard C, Blair SN, Haskell WL. Physical activity and health. United States: Human Kinetics, 2007.

20. Breedveld K, Kamphuis C, Tiessen-Raaphorst A. [*Report Sport 2008*]. The Hague: Social and Cultural Research Institute, 2008. Dutch.

21. Calfas KJ, Long BJ, Sallis JF, Wooten WJ, Pratt M et al. A controlled trial of physician counseling to promote the adoption of physical activity. Prev Med. 1996, 25(3): 225-233.

22. Sluijs EMF van, Poppel MNM van, Stalman WAB, Mechelen W van. Feasibility and acceptability of a physical activity promotion programme in general practice. Family Practice. 2004, 21(4): 429–436.

23. Brusseau T, Kulinna P, Tudor-Locke C, Mars H van der, Darst P. Children's Step Counts on Weekend, Physical Education, and Non-Physical Education Days. J Hum Kinet. 2011, 27: 123–134.

24. Gavarry O, Giacomoni M, Bernard T, Seymat M, Falgairette G. Habitual physical activity in children and adolescents during school and free days. Med Sci Sports Exerc. 2003, 35(3): 525-531.

25. Trost SG, Pate RR, Freedson PS, Sallis JF, Taylor WC. Using objective physical activity measures with youth: How many days of monitoring are needed? Med Sci Sports Exerc. 2000, 32(2): 426-431.

26. Montoye HJ, Kemper HCG, Saris WHM, Washburn RA. Measuring Physical Activity and Energy Expenditure. Champaign, IL: Human Kinetics, 1996.

27. Vincent SD, Pangrazi RP. Does reactivity exist in children when measuring activity levels with pedometers? Pediatr Exerc Sci. 2002, 14(1): 56-63.

28. Crouter SE, Schneider PL, Karabulut M, Bassett DR. Validity of 10 electronic pedometers

for measuring steps, distance and energy cost. Med Sci Sports Exerc. 2003, 35(8): 1455-1460.

29. Le Masurier GC, Tudor-Locke C. Comparison of pedometer and accelerometer accuracy under controlled conditions. Med Sci Sports Exerc. 2003, 35(5): 867-871.

30. Tudor-Locke C, Ainsworth BE, Thompson RW, Mathews CE. Comparison of pedometer and accelerometer measures of free-living physical activity. Med Sci Sports Exerc. 2002, 34(12): 2045-2051.

31. Field A. Discovering statistics using SPSS. London: Sage, 2009.

32. Lynch JW, Kaplan GA, Salonen JT. Why do poor people behave poorly? Variation in adult health behaviours and psychosocial characteristics by stages of the socioeconomic life course. Soc Sci Med. 1997, 44(6): 809-819.

33. Weinstein P, Harrison R, Benton T. Motivating parents to prevent caries in their young children. Journal of American Dental Association. 2004, 135(6): 731-738.

34. Sealy YM, Farmer L. Parents'stage of change for diet and physical activity: influence on childhood obesity. Soc Work Health Care. 2011, 50(4): 274-291.