

Stages of Change for physical activity after a school-based intervention: a cross-sectional study

Estágios de mudança de comportamento para atividade física após uma intervenção escolar: um estudo transversal

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ABSTRACT

The present study aimed to identify factors associated with the Stages of Change (SoC) for physical activity among adolescents who participated in a school-based health promotion intervention. A cross-sectional study was conducted with a sample of 8,071 students whose average age was 13.9 (SD ± 2.4) years. To evaluate the SoC, an adaptation of the questionnaire proposed by Dumith, Domingues and Gigante (2009) was used, considering physical activities performed at least three times per week during 20 minutes. Data collection was carried out from October to November 2013 through self-administered questionnaires in the classroom. The prevalence of students in each stage was: 12.1% in the Pre-contemplation stage, 7.7% Contemplation, 16.8% Preparation, 21.8% Action and 41.6% in the Maintenance stage. Males were more associated with the stages of Action (RR 1.28, 95% CI 1.07-1.54; $p = 0.006$) and Maintenance (RR 3.57, 95% CI 3.02-4.23; $p < 0.001$) compared to females. Economic level and knowledge about health showed a direct relationship to the Action and Maintenance stages. A large portion of the sample was located in active stages. Being male, being in lower school grades and having a higher index of assets were associated with higher SoC. Knowledge about physical activity and health was directly related to the Preparation, Action and Maintenance stages, pointing to a positive effect on intention or active behavior.

KEYWORDS

Students; Intervention Studies; Theoretical Models; Motor Activity; Exercise; Health Promotion.

RESUMO

O presente estudo teve como objetivo verificar os fatores associados aos Estágios de Mudança de Comportamento (EMC) para atividade física em adolescentes que participaram de uma intervenção para promoção da saúde na escola. Foi conduzido um estudo transversal com uma amostra de 8071 estudantes com idade média de 13,9 (DP± 2,4) anos. Para avaliar os EMC, foi utilizada uma adaptação do questionário de Dumith, Domingues e Gigante (2009), considerando AF realizadas no mínimo três vezes por semana durante 20 minutos. A coleta de dados foi realizada de outubro a novembro de 2013, através de questionários autoaplicados em sala de aula. A prevalência de estudantes em cada EMC foi de: 12,1% Pré-contemplação, 7,7% Contemplação, 16,8% Preparação, 21,8% Ação e 41,6% no estágio de Manutenção. O sexo masculino se mostrou mais associado aos estágios de Ação (RR 1,28; IC_{95%} 1,07-1,54; $p=0,006$) e de Manutenção (RR 3,57; IC_{95%} 3,02-4,23; $p<0,001$) em comparação ao sexo feminino. O nível econômico e o conhecimento sobre saúde demonstraram uma relação direta com os estágios de Ação e de Manutenção. Contudo, grande parcela da amostra esteve localizada em EMC ativos. Pertencer ao sexo masculino, estar em séries escolares inferiores e ter maior índice de bens estiveram associados aos EMC mais elevados. O conhecimento sobre atividade física e saúde esteve diretamente relacionado aos estágios de Preparação, Ação e Manutenção, apontando para um efeito positivo sobre a intenção ou comportamento ativo.

PALAVRAS-CHAVE

Escolares; Estudos de intervenção; Modelos teóricos; Atividade motora; Exercício; Promoção de saúde.

INTRODUCTION

The benefits of physical activity practice, as well as the consequences of its absence, have been proved by rigorous worldwide investigations¹⁻⁴. Apart from higher risks for a series of diseases², inactive individuals have higher chances of premature mortality compared to individuals who practice physical activity, even if the latter do not achieve the current weekly recommendations⁴. Among children and adolescents, the concern is even greater, as evidences have shown a decline in physical activity practice among young individuals⁵, which influences health in future ages³.

Therefore, the development of interventions has been strongly recommended as a tool to reverse the current pandemic of physical inactivity¹. However, physical activity practice is multifactorial, as it is a complex behavior that is influenced by psychological, affective and social determinants⁶. Thus, classifying individuals in a dichotomous way, that is, as active and inactive, reduces subjects to only two situations. People with different intentions concerning physical activity practice are classified in the same group, which hinders the understanding of the behavior adoption process⁷.

In this perspective, among people considered physically active, there are those who have already incorporated the habit into their lives and those who have started the practice recently and, therefore, are more susceptible to abandon it. This aspect can also be observed in individuals considered inactive⁷. Those who do not achieve the weekly recommendation, but who have started to practice some amount of physical activity, will continue to be considered inactive, despite the evident behavior change.

Therefore, the Stages of Change (SoC) are a viable alternative: within this model, it is possible to classify individuals based on their intentions concerning physical activity practice⁸. The SoC are the main construct of the Transtheoretical model, which was developed by Prochaska and DiClemente (1983). The model was initially applied to a group of smokers with the aim of analyzing how these people succeed in changing their habits in order to cease their vice⁹. In this model, it is admitted that diverse processes of change occur in a cyclic and dynamic way. Individuals can regress or advance one or more stages before they stabilize their behavior. The model can be applied to diverse health outcomes¹⁰.

The present study aimed to identify factors associated with the Stages of Change (SoC) for physical activity among adolescents who participated in a school-based health promotion intervention.

METHODS

This cross-sectional study is part of the project “*Educação Física +: Praticando Saúde na Escola*” (Physical Education +: Practicing Health at School), an intervention whose main aim was to disseminate contents related to physical activity practice and health through the Physical Education classes. The protocol of the intervention can be found in a previous publication¹¹. The intervention lasted two years. It started in 2012 with 40 public schools in the city of Pelotas, state of Rio Grande do Sul (Southern Brazil), of which 20 were in the intervention group and 20 in the control group. In 2013, there was no control

group and 16 other schools were added, totaling 56 schools, in order to reach the maximum number of schools of the city and disseminate the intervention.

The sampling process was performed in multiple stages, respecting the proportion of urban and rural schools, as well as the proportion of municipal and state schools of the city of Pelotas. Based on the attendance sheets obtained in the schools at the beginning of each year, 15,026 students were considered eligible for the study. Evaluations were conducted at the beginning and in the end of the school periods of 2012 and 2013. This study presents a cross-sectional analysis of the SoC corresponding to the fourth and last monitoring phase of the intervention (2nd semester of 2013), and an important co-variable was the period of exposure to the intervention (1 or 2 years).

To evaluate the SoC, a questionnaire developed by Dumith, Domingues and Gigante⁷ was used. The instrument was adapted to the study's age group and was tested through a pilot study, conducted with students from a public school that was not included in the sample, in order to verify the instrument's applicability. The questionnaire is composed of objective questions related to period of practice and future intentions, and considers physical activities practiced at least three times per week during 20 minutes or more. According to the answers, the individuals were classified in the stages, operationalized in the following way:

- Pre-contemplation: the individual does not practice physical activities on a regular basis and does not intend to begin;
- Contemplation: the practice has not been started, but there is an intention to start it within six months;
- Preparation: there is preparation to the practice, which will begin in less than one month;
- Action: the individual started to practice physical activities less than six months before;
- Maintenance: the behavior has already been acquired and has been maintained for more than six months.

The independent variables included in the study were sex (male/female), age (in full years, categorized into five groups: ≤ 12 , 13, 14, 15, ≥ 16 years), grade (from the 5th grade of Junior High School up to the 3rd grade of High School), index of assets (quintiles), and knowledge about health. The variable index of assets was constructed based on a list of consumption goods, submitted to principal component analysis and divided into five quintiles (the first quintile refers to the 20% poorest individuals). Finally, the variable knowledge about health was obtained through an instrument created for this intervention, composed of 10 objective questions and based on the contents developed for each grade. A score was created according to the number of right answers in the test, and the students were subsequently categorized in two groups based on the score's median. Thus, two groups of analysis were obtained: the group "below the median" received the lowest scores, and the group "above the median" had the highest scores within the grade.

Data collection was carried out from October to November 2013. The questionnaires were self-administered in the classroom according to the days and times established by the schools. This procedure was conducted by a team

of interviewers who received an 8-hour theoretical/practical training given by the researchers in charge of the study.

The database was constructed with the aid of the EpiData software version 3.0, in which the data were keyboarded and validated twice to identify inconsistencies. The analyses were performed in the statistical Stata software version 12.0. The data were initially described through the distribution of proportions and bivariate analyses, using a chi-square test for heterogeneity and linear trend. The principal analyses, considering the co-variables and the evaluation of the SoC for physical activity, were conducted through multinomial regression. The Pre-contemplation category was used as reference. The following analytical levels were considered: first level – sociodemographic variables (sex, age, grade, index of assets); second level – exposure to the intervention; third level – knowledge about health.

The project was approved by the Research Ethics Committee of *Escola Superior de Educação Física*, protocol number 039/2011. The parents of students younger than 18 years, as well as students aged 18 years or older, were requested to give their consent in writing.

RESULTS

The sample was composed of 8,701 students, representing 53.7% of the individuals eligible for the intervention. The study obtained a response rate of 55.1% among Junior High School students and 45.1% among High School students. The students' average age was 13.9 (SD± 2.4) years, and the majority of the interviewees was of the female sex (52.4%). The sample's description according to demographic and behavioral variables is available on Table 1. Regarding the SoC, the largest portion of the sample was in the Maintenance stage (41.6%), as described in Figure 1.

The crude associations between the SoC and the independent variables are described on Table 2. It is possible to verify that the male sex had a higher prevalence of individuals in the active SoC, with the highest frequency in the Maintenance stage. Regarding age, an inverse relationship can be noted concerning the stages connected with physical activity practice, as there is a decline in the prevalence of individuals in the Action and Maintenance stages as age increases. Concerning the index of assets, it is possible to verify that the highest quintile has the largest amount of individuals in the Maintenance stage (47%). As for knowledge about health, there was a strong association with the SoC. The period of exposure to the intervention did not have a significant association with the SoC in the bivariate analysis.

The adjusted analyses of the association between the SoC and the independent variables are described on Table 3. Concerning sex, there was a higher presence of boys in the active behavior stages (Action: RR 1.28; CI_{95%} 1.07-1.54; p=0.006; Maintenance: RR 3.57; CI_{95%} 3.02-4.23; p<0.001) compared to girls. Regarding the variable index of assets, there was a direct relationship to the Action and Maintenance stages (Action: RR 1.42; CI_{95%} 1.06-1.90; p=0.045; Maintenance: RR 1.51; CI_{95%} 1.16-1.98; p<0.001) compared to the reference category (Pre-contemplation). The variable exposure to the intervention proved to be associated with the outcome only in the Action category (RR 0.75; CI_{95%} 0.62-0.90; p=0.003) in the adjusted analysis. Finally,

TABLE 1 – Description of the sample according to demographic variables (sex, age, grade and index of assets), period of exposure to the intervention and knowledge about health. Pelotas, RS, Brazil (2013).

Variable	N	%
Sex		
Male	3840	47.6
Female	4231	52.4
Age (years)		
≤12	1741	21.8
13	1481	18.5
14	1540	19.3
15	1299	16.3
≥16	1929	24.1
Grade		
Junior High School		
5 th	1873	23.2
6 th	1597	19.8
7 th	1519	18.8
8 th	1186	14.7
High School		
1 st	929	11.5
2 nd	606	7.5
3 rd	361	4.5
Index of Assets (Quintiles)*		
1 (lowest)	1316	20
2	1345	20
3	1365	20
4	1356	20
5 (highest)	1352	20
Period of exposure to the intervention		
1 year	5695	65.8
2 years	2961	34.2
Knowledge about health**		
Below the median	5085	63.0
Above the median	2986	37.0
Total	8071	100.0

*The maximum number of unknown values was 1337. **Median of the score in each grade

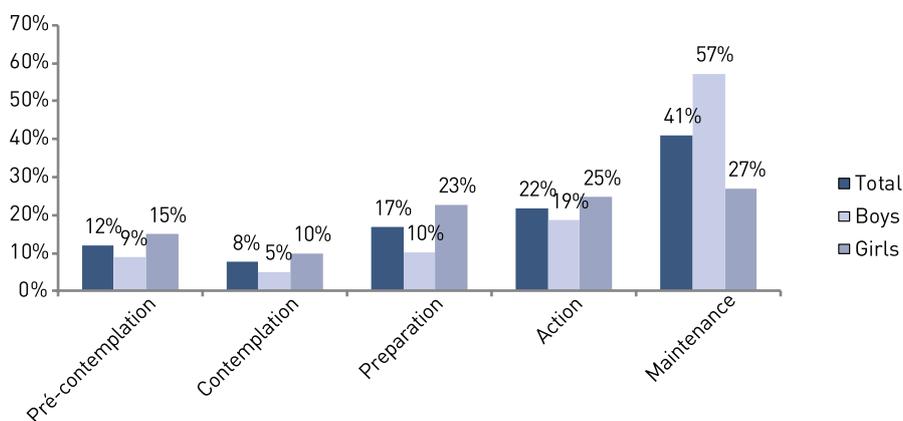


FIGURE 1 – Prevalence of the students' Stages of Change for physical activity. Pelotas, RS, Brazil

TABLE 2 – Crude analysis of the association between the students' Stages of Change for physical activity and the independent variables. Pelotas, RS, Brazil, 2013.

Variable	Stages of Change %					p-value
	Pre-contemplation	Contemplation	Preparation	Action	Maintenance	
Sex						p<0.001 ^a
Male	8.9	5.1	10.2	18.6	57.2	
Female	15.0	10.0	22.8	24.7	27.6	
Age (years)						p<0.001 ^b
≤12	11.6	4.7	14.7	24.7	44.3	
13	13.1	6.1	14.9	23.6	42.3	
14	13.1	7.6	17.2	22.4	39.8	
15	11.0	8.9	18.6	19.6	41.9	
≥16	12.0	10.7	18.6	18.7	40.2	
Grade						p=0.01 ^b
Junior High school						
5 th	12.1	5.1	14.0	24.2	44.6	
6 th	13.3	5.2	13.8	24.5	43.1	
7 th	12.3	6.8	17.0	22.7	41.2	
8 th	11.5	8.3	20.9	19.0	40.3	
High School						
1 st	10.7	11.6	20.2	17.3	40.2	
2 nd	12.8	12.2	17.5	19.8	37.7	
3 rd	9.8	15.2	20.2	18.3	36.5	
Index of Assets (Quintiles)						p<0.001 ^b
1 (lowest)	13.3	6.6	17.0	22.1	41.0	
2	13.3	6.9	16.0	24.6	39.2	
3	12.0	8.5	17.8	22.3	39.4	
4	11.5	8.9	16.9	20.8	42.0	
5 (highest)	9.3	6.1	15.8	21.8	47.0	
Period of exposure to the intervention						p=0.01 ^a
2 years	10.6	7.5	16.5	24.5	40.9	
1 year	12.6	7.3	16.7	21.2	42.2	
Knowledge about health						p<0.001 ^a
<4 right answers	14.3	8.1	16.5	21.3	39.9	
≥4 right answers	8.4	7.0	17.4	22.7	44.5	

^aChi-square test ^bLinear trend chi-square test

the variable knowledge about health presented significant differences in all the SoC (p<0.001), and there was a higher probability of the individuals with greater knowledge being located in active stages (Preparation: RR 1.72; CI_{95%} 1.40-2.10; Action: RR 1.74; CI_{95%} 1.43-2.12; Maintenance: RR: 1.74; CI_{95%} 1.44-2.11) compared to the reference category.

TABLE 3 – Adjusted analysis between the students' Stages of Change for physical activity and the co-variables obtained through multinomial regression. Pelotas, RS, Brazil (2013).

Variable	Stages of Change RR (CI _{95%})			
	Contemplation	Preparation	Action	Maintenance
Sex	p=0.072	p=0.008	p=0.006	p<0.001
Female	1.0	1.0	1.0	1.0
Male	0.79 (0.62-1.02)	0.76 (0.62-0.93)	1.28 (1.07-1.54)	3.57 (3.02-4.23)
Age (years)	p=0.001	p=0.051	p=0.011	p=0.051
≤12	1.0	1.0	1.0	1.0
13	1.14 (0.74-1.76)	0.85 (0.61-1.18)	0.89 (0.67-1.20)	0.82 (0.62-1.08)
14	1.12 (0.71-1.77)	0.80 (0.56-1.13)	0.89 (0.65-1.22)	0.75 (0.56-1.01)
15	1.13 (0.68-1.88)	1.00 (0.68-1.46)	0.92 (0.65-1.31)	0.89 (0.64-1.23)
≥16	0.94 (0.54-1.63)	0.80 (0.52-1.22)	0.75 (0.50-1.11)	0.75 (0.52-1.08)
Grade	p=0.003	p=0.854	p=0.598	p=0.304
Junior High School				
5 th	1.0	1.0	1.0	1.0
6 th	0.72 (0.48-1.10)	0.86 (0.63-1.16)	0.90 (0.68-1.18)	0.84 (0.65-1.09)
7 th	0.99 (0.64-1.54)	1.14 (0.81-1.60)	0.82 (0.60-1.12)	0.86 (0.64-1.15)
8 th	1.35 (0.83-2.21)	1.52 (1.04-2.23)	0.81 (0.56-1.16)	0.95 (0.68-1.32)
High School				
1 st	2.18 (1.25-3.80)	1.39 (0.88-2.19)	0.76 (0.49-1.17)	0.93 (0.62-1.38)
2 nd	2.26 (1.19-4.29)	1.46 (0.86-2.47)	0.94 (0.57-1.56)	0.89 (0.56-1.43)
3 rd	3.43 (1.69-6.96)	1.85 (1.01-3.39)	1.05 (0.58-1.91)	1.20 (0.70-2.08)
Index of Assets (Quintiles)	p=0.070	p=0.052	p=0.045	p<0.001
1 (lowest)	1.0	1.0	1.0	1.0
2	0.95 (0.66-1.38)	0.89 (0.67-1.19)	1.11 (0.85-1.45)	0.91 (0.71-1.17)
3	1.27 (0.88-1.82)	1.09 (0.81-1.45)	1.13 (0.86-1.49)	1.04 (0.80-1.34)
4	1.33 (0.92-1.91)	1.07 (0.80-1.44)	1.10 (0.83-1.46)	1.16 (0.90-1.51)
5 (highest)	1.10 (0.74-1.64)	1.20 (0.88-1.63)	1.42 (1.06-1.90)	1.51 (1.16-1.98)
Period of exposure to the intervention	p=0.114	p=0.193	p=0.003	p=0.287
2 years	0.82 (0.64-1.04)	0.87 (0.71-1.06)	0.75 (0.62-0.90)	0.90 (0.76-1.08)
1 year	1.0	1.0	1.0	1.0
Knowledge about health	p<0.001	p<0.001	p<0.001	p<0.001
<4 right answers	1.0	1.0	1.0	1.0
≥4 right answers	1.67 (1.30-2.15)	1.72 (1.41-2.11)	1.74 (1.44-2.12)	1.75 (1.46-2.10)

*The pre-contemplation stage was used as a reference category.

DISCUSSION

This study aimed to identify factors associated with the Stages of Change (SoC) for physical education among adolescents who participated in a school-based health promotion intervention, the project “*Educação Física +: Praticando Saúde na Escola*” (Physical Education +: Practicing Health at School). Some aspects of the study deserve to be highlighted. It is a population-based study with cross-sectional aspects related to the application of the first school-based intervention carried out in the city of Pelotas.

On the other hand, some limitations must be mentioned here. The first regards the rates of losses and refusals. The obtention of the parents' written authorization prevented us, to a large extent, from having higher monitoring rates. Another important issue was the evaluation of the SoC through the

adaptation of an instrument validated for adults. Despite the methodological precautions and although the analysis was based on a pilot study, this may have overestimated the prevalence of individuals in the Action and Maintenance stages due to the sensitivity of the concept of physical activity that was established. In addition, the absence of SoC data in the baseline of the intervention precluded conclusions about the program's effects on the sample's intention to practice physical activity.

Generally speaking, the results showed a higher frequency of adolescents in the Maintenance stage (41.6%), followed by Action (21.8%) and Preparation (16.8%). A Belgian study that had a similar sample and also used an instrument validated for adults showed similar results in relation to the SoC, with a high proportion of adolescents in the Maintenance stage (50.4%)¹². Many studies that investigated children and adolescents have found similar prevalences, with 60% to 80% of the sample in the Action or Maintenance stages¹²⁻¹⁴.

Our results show that the male sex was more likely to be classified in stages that involve the practice of physical activity compared to the female sex. Other studies that used the SoC as an instrument to evaluate physical activity with a cross-sectional design have presented similar results, with a greater presence of the male sex in active SoC^{12,16,17}. On the other hand, in our investigation, the female sex was more likely to be classified in the Preparation stage, which shows an intention to practice physical activity in the near future.

The variables age and grade were associated with the SoC only in the Contemplation stage in the adjusted analysis. Concerning the variable grade, a direct relationship was noted between the risks of being in the Contemplation stage and higher school grades. Theoretically, the increase in age enables the individual's access to a greater range of experiences and information on different types of physical activity; however, this has not represented a higher probability of assuming an active behavior. Previous studies have shown that there is decrease in physical activity levels as age increases, and this scenario can be explained by multiple social, biological, behavioral and environmental factors¹⁸. Specifically in the school environment, the accumulation of academic tasks in High School is evident, characterized by the dominance of theoretical disciplines in the school curriculum to the detriment of disciplines targeted at body movement. This can explain the decline in physical activity levels in this population^{19,20}.

The Action and Maintenance stages proved to be directly related to the economic level. A study that evaluated the SoC of adolescents in the state of Pernambuco (Northeastern Brazil) has identified other indicators of socioeconomic conditions as factors that influence the SoC, like place of dwelling and labor activities¹⁶. The individuals' social context has been constantly pointed as a determining factor of physical activity practice, a fact that has been proved by previously published studies, which have found a direct relationship between physical activity level and variables related to family income^{3,21,22}.

The main independent variable of the present study was the period of exposure to the intervention, which was associated only with the SoC category "Action". When compared to the least exposed group (1 year), the individuals who were more exposed to the intervention (2 years) obtained a lower risk of being in the SoC category "Action". This result leads us to believe that the intervention had no power to maintain the individuals' physical activity level

during the two years of monitoring. These results corroborate the major part of the intervention studies that used the SoC as the form of evaluation, which have found positive results in the short term^{23,24}. Unlike the present study, interventions that obtained short-term effects generally take other constructs of the Transtheoretical model into account (behavior change processes, behavior change stages, decisional balance, self-efficacy) in the development and evaluation of the study²⁵⁻²⁸. It is important to highlight that our protocol was centered on a health promotion model, with an approach that was essentially educational, and did not use constructs of the Transtheoretical model to subsidize the developed activities.

Finally, the variable knowledge about health was significantly related to the outcome in all the stages, and had a higher probability in the Preparation, Action and Maintenance stages. This fact indicates the influence of knowledge about physical activity and health on the chances of being in advanced SoC. The literature in general suggests that the contribution of knowledge about the adoption of an active lifestyle is limited²⁹. However, when it is associated with other facilitating factors, it may play a decisive role in the individuals' choices²⁰.

Based on the results presented here, it is possible to notice that a large portion of the sample was located in active SoC, such as Action and Maintenance. In spite of the limitation caused by the study's design, an association was found between a short exposure to the intervention program and a small increase in the physical activity behavior (Action stage). As for the other independent variables, being male, being in lower school grades and having a higher index of assets were also related to higher SoC. Furthermore, knowledge about physical activity and health was directly related to the Preparation, Action and Maintenance stages, pointing to a positive effect on intention or active behavior.

In light of the fact that the instrument used to collect the outcome had been previously validated for another population and had a very sensitive criterion to determine the students' physical activity practice, it is necessary to validate a specific algorithm for children and adolescents in order to enable a more accurate evaluation of the SoC in this population. Our study contributes to the scientific literature because it identifies indicators that can show more clearly the effectiveness of school-based interventions whose theme is physical activity and health. However, it is still necessary to conduct studies that focus on using the SoC in the evaluation of interventions. In addition, intervention studies with cross-sectional evaluations of the SoC can enhance knowledge about the effects of school-based interventions on behavior change related to physical activity practice, as this approach is capable of capturing intentions related to this behavior. Likewise, the inclusion of other constructs of the Transtheoretical model (behavior change processes, decisional balance, self-efficacy), both in the evaluation and in the development of programs, can intensify the intervention's effects, enhancing the understanding of the youths' behavior change process.

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