Original Article

Physical Activity Self-efficacy and its Correlation with Cardiorespiratory Fitness, Physical Activity Levels, and Sedentary Time among Urban School Going Adolescents: A Cross-sectional Analysis

Rajitha Alva[1], Sundar Kumar Veluswamy[1], Ridhi Verma[1], Priyanka Malla[1], Shalini Shivananjiah[2]

[1]Department of physiotherapy, [2]Department of Community Medicine, Ramaiah Medical College, Bengaluru, Karnataka, India

Abstract

Background: There is growing concern about reduction in physical activity and increase in sedentary time among children and adolescents. School health programs are being promoted by our government, but the usually suggested behavioral change interventions (BCIs) to improve physical behavior have not been tested in our school population. The BCIs are built on the premise that there is a relationship between constructs such as self-efficacy with physical activity and sedentary time. This study represents the pre-intervention data of an ongoing randomized controlled trial (RCT). **Aim:** The study aims to assess the relationship between physical activity self-efficacy and cardiorespiratory fitness (CRF), physical activity levels, and sedentary time. **Participants:** Participants were students of grades 7–9 from three private schools. **Methods and Analysis:** Following ethical approval, CTRI registration, and school and parent consent, 272 adolescents volunteering to participate in the RCT completed Self-Efficacy for Daily Physical Activity Questionnaire (SEPA), Physical Activity Questionnaire for Adolescents (PAQ-A), and Adolescent Sedentary Activity Questionnaire (ASAQ). CRF was assessed using a 20-m multistage shuttle run test and VO_2 max was estimated using Leger's formula. Descriptive statistics and correlation (Pearson's and Spearman's rank) between the variables were done in SPSS v.20. **Results:** Children (54% boys) had a mean age and body mass index of 12.8±0.9 years and 20.7±5 kg/m^2, respectively. Mean of SEPA, ASAQ, and VO_2 max were 58.2±23.2, 2662±1024 min, and 41±5.2 mL/kg/min, respectively. Majority (51%) had moderate levels of PA. There was a weak correlation of SEPA with PAQ-A (r_s=0.31; $P < 0.001$), whereas there was no significant correlation of SEPA with other variables. **Conclusion:** Contrary to studies from western societies, SEPA did not correlate with CRF and sedentary time. There seems to be limitations in the construct of questionnaires in capturing self-efficacy and sedentary behavior in this population.

Keywords: *Cardiorespiratory fitness, Physical behavior, Self-efficacy*

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Introduction

Physical inactivity and sedentary behavior are prevailing issues among school going children and adolescents in India.[1] 2018 India's report card on physical activity revealed that more than 70%

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Address for correspondence: Ms. Rajitha Alva & Dr. Sundar Kumar Veluswamy,
Department of Physiotherapy,
Ramaiah Medical College, Bengaluru, Karnataka, India.
E-mail: alvarajju@gmail.com; sundark94@gmail.com

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of the children are not accumulating World Health Organization-recommended 60 min of physical activity per day.[2] Emerging evidence suggests that multiple physical activities promoting interventions are available to promote physical activity among school going children and adolescents. Among the various physical activity promoting interventions, school-based interventions, behavioral modification interventions, family-based interventions, and theory-based intervention are quite popular.[3]

It is a well-established fact that behavioral interventions play an integral role in modifying various health behaviors among adults.[4] In the recent times, behavioral modification strategies are used quite extensively to increase physical activity and reduce sedentary behaviors across the life span. However, literatures related to school going adolescents on behavioral interventions are sparse in developing countries.

These behavioral modification strategies are developed based on various theories such as social cognitive theories (SCTs), trans-theoretical model (TTM), health belief model (HBM), etc. for improving physical behaviors.[5] Physical behavior is a construct, which includes physical activity and sedentary behavior together. Individual's behavior is a true reflection of their self-efficacy levels. Evidence suggests that self-efficacy of physical activity is one of the important determinants of physical behavior across the life span. Self-efficacy is derived by various behavioral theories and considered as an important indicator of health behavioral change.[6]

In the western literature, it is well-known fact that children and adolescents with higher levels of physical activity self-efficacy are likely to have higher levels of physical activity and low sedentary time.[6] Self-efficacy is a behavioral construct, which can vary based on different socio-cultural and economic contexts.[7] It is imperative to understand the relation of physical activity self-efficacy with sedentary time, physical activity, and fitness levels with respect to various different socio-cultural contexts. Therefore, this study aims to evaluate physical activity self-efficacy and its correlation with cardiorespiratory fitness, physical activity levels, and sedentary time among urban school going adolescents.

Materials and Methods

The present cross-sectional study is a part of ongoing interventional study funded by Rajiv Gandhi University of Health Sciences (RGUHS), Bengaluru, India. This study is approved by the Institutional Ethical Committee and registered under clinical registry (CTRI No.: CTRI/2018/05/014190). Data were collected during the academic period between June and December 2018. Prior to data collection, school management permission was obtained to recruit participants. Informed consent was obtained by all the parents or guardians and assent form was obtained from all the study participants. Normal healthy students of 7th to 9th grade were recruited from three different private schools of North Bengaluru. Students with any recent injuries, fractures, cardiorespiratory, neurological, and musculoskeletal problems were excluded from the study. All the 7th to 9th grade students were given the study invite and were selected based on their consent to participate in the study.

Sample size calculation was considered as per the ongoing interventional study. Sample size was estimated with effect size 0.4 based on the standard deviation (SD) of 67 min reported among Indian (Bangalore) children from the International Study of Childhood Obesity, Lifestyle, and the Environment (ISCOLE) in 2016.[8] For an effect size of 0.4, an alpha of 0.05, and 90% power, a minimal sample required for each group was 108. Considering 20% dropout, a total of 270 participants were required for the study. A total of 272 students were recruited in the study.

Physical activity self-efficacy is assessed using Self-Efficacy for Daily Physical Activity Questionnaire (SEPAQ),[9] sedentary time is assessed using Adolescent Sedentary Activity Questionnaire (ASAQ),[10] physical activity is assessed through Physical Activity Questionnaire for Adolescence (PAQ-A), and cardiorespiratory fitness was evaluated through a 20-m shuttle run test using EURO-FIT protocol. All the questionnaires used in the study were self-reported questionnaires. Sedentary time was considered based on the World Health Organization recommendation of less than 2 h of sedentary time.[11] Physical Activity Questionnaire is a 9-item questionnaire with 5-point rating scale and higher the score indicates good physical activity levels. Physical activity levels are categorized into low, moderate, and high levels based on PAQ-A questionnaire norms. SEPAQ is a domain-specific scale which consisted of five major domains such as school, transport, household, leisure and recreational activities, and occupational. Participants were expected to rate their level of confidence in performing any activities related to day to day and physical activity. Cardiorespiratory fitness is considered as one main predictor of physical fitness level of individual and predominantly poor among school going students. Therefore, only one component of physical fitness

was assessed in the study. Fitness was determined by estimating VO_2 max. VO_2 max was calculated using Leger's formula [VO_2 max =31.025 +3.238 X – 3.248A +0.1536AX (A= Age, X= Speed)]. Eurofit norms were used to interpret VO_2 max values in our study.[12]

After obtaining permission from the school, students of 7th to 9th grade class teachers were contacted for free hours to collect data. Before data collection, research assistants were trained to collect data and conducted a pilot test to avoid any errors during data collection. Students were provided a week's time to submit informed consent and assent forms after which students were recruited to the study. All the questionnaires were filled with the research assistant's supervision in the class room during the free hour. Before conducting 20-m shuttle run tests, students were screened for basic health problems and then proceeded with the test.

Data analysis

All the collected data were coded and entered in the Excel sheet. Data are analyzed using SPSS software version 20. Descriptive statistics were used to represent the basic demographic details [age, gender, body mass index (BMI)] and outcome variables (PAQ-A, SEPA, ASAQ, and VO_2 max). Mean and SD were used to present age, BMI, PAQ-A, SEPA, ASAQ, and VO_2 Max. Percentage (%) was used to present the gender and physical activity levels. As the SD obtained in all the outcome variables was large and considering the large dataset, correlation analysis was analyzed using the non-parametric test. Correlation between self-efficacy and other outcome variables (PAQ-A, ASAQ, and Vo_2 max) was analyzed by using Pearson's and Spearman rank correlation coefficient with a significance level of 0.01 (two-tailed).

Results

A total of 272 students of 7th to 9th grades were selected in the study. Table 1 provides a detailed gender-wise distribution of participants. Among the 272 students, 54% were boys, and mean age of all the participants was 12± 0.9 years with the mean BMI of 20.7±5 kg/m^2. Table 2 presents descriptive statistics of demographic (age and BMI) and outcome variables (SEPA, ASAQ, and Vo2 max). Self-efficacy of physical activity was 58.2% (±23.2%), which reflects that participants are in the range of moderate-to-high levels of self-efficacy. In the study, we considered 70% and above as high self-efficacy, 50–70% as moderate self-efficacy, and less than 50% as low self-efficacy. Total sedentary time spent in a week is 2662 (±1024) min; weekday sedentary time is 962.74 (±396.9) min and weekend sedentary time is 1767.3 (±816.0) min. Results suggest that sedentary time was markedly increased in the weekend compared to weekdays. Overall, most of the students presented having sedentary time of more than 2 h of World Health Organization recommended time in a day. Estimated mean VO_2 max of the entire population was 41(±5.2) mL/kg/min; it indicates low fitness levels among our data in comparison to the Eurofit norms.[11] Physical activity levels were categorized into three: low, moderate, and high physical activity levels. In this study, 51% of the students represented moderate levels of physical activity, 27% represented low levels of physical activity, and only 21% of the students presented high levels of physical activity. Descriptive results clearly state that 50% of the participants exhibited moderate levels of physical activity. Table 3 represents correlation of self-efficacy levels with other outcome variables (physical activity levels, sedentary time, and physical fitness levels). There was a weak correlation between self-efficacy and physical activity levels, which was statistically significant (r_s= 0.31, P = 0.000). There was no correlation found between self-efficacy and sedentary time (r_s= 0.044, P = 0.517) and self-efficacy and fitness (VO_2 max) levels (r_s= 0.038, P = 0.536). Overall, the results suggested that self-efficacy of daily physical activity established no correlation with physical activity levels, sedentary time, and physical fitness among school going adolescents.

Table 1: Grade and gender-wise distribution of participants

Grades	Male (%)	Female (%)	Total (%)
7th grade (n = 95)	23.52%	11.39%	34.94%
8th grade (n = 74)	15.07%	12.13%	27.20%
9th grade (n = 103)	15.8%	22.05%	37.86%
Total (n = 272)	45.57%	54.41%	

Discussion

The current study tried establishing student's physical activity self-efficacy levels with cardiorespiratory fitness, physical activity and sedentary time in a developing country perspective. Based on the western literature, we hypothesized that self-efficacy levels are positively correlated with all the outcome variables included in the study. Our study showed contradictory results in comparison to western studies.

Table 2: Descriptive statistics of demographic and outcome variables

Variables (n = 272)	Mean, SD
Age (years)	12.8±0.9
BMI (kg/m^2)	20.7±5
SEPA	58.2±23.2
ASAQ (min)	2662±1024
VO_2 max (mL/kg/min)	41±5.2

Table 3: Correlation of self-efficacy with physical fitness, PA level, and sedentary time

Variables (n = 272)	SEPA correlation (r_s)	Significant level (P-value)
Fitness (VO_2 peak)	0.038	0.536
PA level (PAQ-A)	0.31	<0.005
Sedentary time (ASAQ)	0.044	0.038

Level of significance was set at P-value <0.005. PA = physical activity

Self-efficacy is recognized as an important construct for modifying various negative behaviors such as smoking, other addictions and lifestyle modifications across life span.[13] All the students in the study exhibited high-to-moderate levels of self-efficacy. In general, individuals with high-to-moderate levels of self-efficacy expected to have low sedentary time, high physical activity, and good fitness levels. Wherein our findings suggest students with moderate-to-high levels of self-efficacy participants representing very high sedentary time, low cardiorespiratory endurance levels, and also moderate levels of physical activity. However, there was a weak correlation found between self-efficacy and physical activity levels as 50% of the students achieved moderate levels of physical activity in the study. This weak correlation obtained in the study is unexplainable as all the students obtained high sedentary time.

However, self-efficacy importance in modifying physical activity behavior and fitness was not supported by our data. There are various reasons for not correlating self-efficacy with other outcome variables of the study rather than undermining the importance of self-efficacy. After analyzing our results in depth, we are postulating two main theories for self-efficacy not being correlating with study outcome variables. One of the main reasons is whether or not our adolescent population understood the construct of self-efficacy correctly. Students understanding the concept is very important, before answering the questions. Another theory is that self-efficacy questionnaire used in the study is western-based, not validated for Indian adolescent population. Also, the other questionnaires (PAQ-A, ASAQ) adopted in the study were also not validated for our population. Questions and activities included in the questionnaire were specific to the western culture and context. Hence, we consider due to the poor construction of the questionnaires used in the study; data captured pertaining to self-efficacy and physical behavior were limited. Our literature review was unable to reveal any developing country specific questionnaires in terms of assessing self-efficacy level of physical activity among school going children and adolescents.

One of the major limitation encountered in the study was unable to adopt Indian context questionnaire and non-availability of normative values for cardiorespiratory fitness (VO_2 max) among school going children and adolescents in the study. It is very essential that questionnaires used in the study must be validated to specific population, so that tool is adopted to that sociocultural and economic context. There arises the need for us to develop Indian specific tool to evaluate self-efficacy of physical activity levels among children and adolescents to eliminate the cultural bias. Future studies must focus on finding the self-efficacy relation with physical activity, sedentary time, and physical fitness incorporating validated tool with the Indian context. Other major drawback was that data obtained for the study were limited to urban area and private schools; it is very important to have inclusive data to analyze the self-efficacy levels pertaining to different socio-economic strata in the developing country.

Conclusion

Self-efficacy of daily physical activity is not correlated with cardiorespiratory fitness and sedentary time and there is a weak correlation with physical activity levels among adolescents. Our findings indicate the need for in-depth studies on the construct of self-efficacy questionnaire and its assessment in our population.

Future implication

There is a strong need to develop cultural adaptation to physical behavior (physical activity and sedentary time) questionnaires among school going children and adolescents as there are no tools available in the Indian context.

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Conflict of interest

There are no conflicts of interest.

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