Original Article (short paper)

Can participation in sports during childhood influence physical activity in adulthood?

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Abstract — Aims: The promotion of sports participation during the early years of life is important not only because it promotes health during childhood and adolescence, but also because it has benefits in adulthood. This study was developed to identify the association between sports participation during the early years of life and adulthood, to analyze the non-participation in sports throughout life and to identify the correlates of non-participation in sports. **DESIGN:** Cross-sectional study. **Methods:** The sample was composed of 743 adults randomly selected in a medium-size Brazilian city. Non-participation in sports during childhood and adolescence was assessed through specific questions, and non-participation in sports in adulthood was assessed using the second section of Baecke questionnaire. Answering "no" in the three periods assessed (childhood, adolescence and adulthood) was characterized as non-participation in sports throughout life. Chronological age, sex, formal education, BMI, current job and ethnicity were considered covariates. Categorical data were expressed as rates and compared using chi-square test and binary logistic regression. **Results:** The prevalence of adults not engaged in sports throughout life was 58.5% (95% CI= 55.1 – 62.1). Females (OR = 2.41 [1.71 – 3.38]), those more advanced in age (OR = 3.29 [1.82-5.94]) and/or possessing a lower level of education (OR = 4.47 [2.45 – 8.17]) were associated with the non-engagement in sports. **Conclusion:** Non-participation in sports during childhood can influence non-participation in sports during adulthood, which is significantly affected by sex, age and education level.

Keywords: health, exercise, childhood, adolescent, pediatrics

Introduction

The promotion of lifelong physical activity and a healthy lifestyle is among the main purposes of public health in many countries[1]. Investments in programs promoting sports participation is usually based on the belief that physical activity is beneficial to youth health, that it becomes habitual over time, and that these positively influence health outcomes in the adult population. Many transitions and life changing events during the course of one's life canaffect physical activity levels, and therefore, this habit is likely to vary in different phases of life[2].

Recently, sports participation was recognized by the International Society for Physical Activity and Health as "an investment that works" to promote physical activity (Trost, 2014). Additionally, studies indicate its potential to boost physical fitness, mental health and social behavior. Research also reveals how this behavior during youth can develop assets that endorse positive trajectories during life[22].

In this perspective, the promotion of sports participation during the early years of life is important not only because it promotes health during childhood and adolescence[3-6] but also because it stimulates engagement in physical activity in adulthood.[7] From a preventive point of view, it is reasonable to believe that adults who participated in sports or attempted some kind of extracurricular activities (e.g. leisure, commuting by bicycle) from a younger age tend to have a healthier life, more so than those who did not participate in anything[8], enhancing the importance of sports participation in pediatric populations[6, 9, 23]. However, more information is needed about this field[24].

The identification of groups with a higher risk of being physically inactive during life is essential for elaborating public health decisions to decrease this unhealthy behavior[6]. However, most studies have focused in sports participation in youth or in adults in separate ways, not looking into the tracking of sports participation from childhood to adulthood. Therefore, engagement in sports participation throughout life is an outcome poorly investigated, mainly in developing countries; even cross-sectional studies with a retrospective design are scarce[8, 10, 11] These studies also suggest the fact that sports participation significantly increases physical activity during adolescence and early adulthood. It should further be commented that these findings should be replicated globally in more populpations to improve the basis of all this evidence[25].

Thus, the purposes of the present study were i) to identify the association between sports participation during the early years of life and adulthood, ii) to analyze the non-engagement in sports throughout life, as well as iii) to identify the correlates of non-engagement in sports in a randomly selected sample from a medium-size Brazilian city.

Methods

Sample and sampling

This cross-sectional study was conducted in 2012 in the city of Presidente Prudente, which is located in the western region of the state of Sao Paulo, the most industrialized state in Brazilian. The city has approximately 208,000 inhabitants and a human development index of 0.846.

The sample size was estimated considering that 50.7% of adults were physically inactive in childhood, adolescence and adulthood [8], given an error of 4% and a significance of 5% (z = 1.96). Predicting future dropouts, an additional rate of 20% was added over the initial sample size. Therefore, a sample size of 720 participants was estimated to be representative. Inclusion criteria were defined: (i) age ≥18 years; and (ii) living for at least two years in their current house. The final sample size was composed of 743 adults.

Data collection was conducted in two stages. First, the city was stratified into five geographical regions (east, west, north, south and center), and through a random process, 20 streets and avenues were selected per neighborhood, totaling 170. For the second stage, six houses were randomly chosen from the streets and avenues previously selected. Data collection happened on Saturdays and Sunday (from 9:00 am to 6:00 pm) during ten consecutive weeks. All adults from the selected houses were eligible for the face-to-face interview.

Prior to implementation, the study was approved by the Ethics Committee Group from Sao Paulo State University (UNESP) Presidente Prudente, Brazil (CAAE: 07770112.3.0000.5402), and all subjects were asked to sign a standard consent form.

Non-engagement in sports throughout life

Sports participation during childhood and adolescence was analyzed using two questions[8, 11]: (i) "Outside school, were you ever engaged in any organized/supervised sport activities for at least one year from age 7 to 10 years old?". If yes, the participant would select the sport: soccer, basketball, volleyball, handball, dance, other, and (ii) "Outside school, were you ever engaged in any organized/supervised sport activities for at least one year from age 11 to 17 years old?". If yes, the participant would select the sport: soccer, basketball, volleyball, handball, dance, other.

Information concerning sports participation among adults was assessed using the second section of the questionnaire, developed by Baecke and colleagues[12] . Three aspects of exercise/sports participation was analyzed: i) intensity (low, moderate, or vigorous), ii) minutes per week (< 60 minutes/week; 60–120 minutes/week; 120–180 minutes/week; 180–240 minutes/week; > 240 minutes/week), and iii) previous time engaged (<1 month, 1–3 months, 4–6 months, 7–9 months, > 9 months). Participants were considered sufficiently active when they reported at least 180 minutes of exercise/sports per week with moderate or vigorous intensity over the last four months (4–6 months).

The main outcome of this study was the non-engagement in sports throughout life, characterized by lack of sports participation during the three phases of one's lifespan considered in this article: childhood, adolescence and adulthood.

A pilot study was carried out in a subsample with similar characteristics (not included in the study [n= 20]) to assess reproducibility of the self-reported data (the second face-to-face interview was performed 14 days after the first interview). Physical activity during childhood (kappa index = 0.70; P-value = 0.001), adolescence (kappa index = 0.89; P-value = 0.001) and adulthood (rho = 0.88; P-value = 0.001) showed moderate to high scores of reproducibility.

Independent variables

Age, sex (male and female), level of education, body mass index (BMI), current job, and ethnicity (defined as white, black, oriental or other) were treated as covariates. Chronological age was structured as a categorical variable (18-29.9 years; 30-44.9 years; 45-59.9 years; ≥ 60 years), as well as level of education (<4 years; 5-8 years; high school; college or more). Participants self-reported body weight (kg) and height (m) during the face-to-face interview, and BMI was calculated as body weight divided by height squared (expressed as kg/m^2). Overweight and obesity were identified as BMI between 25-29.90 kg/m^2 and BMI ≥30 kg/m^2, respectively.

Statistical Procedures

Categorical data were expressed as rates and compared using the chi-square test (Yates' correction has been used in 2x2 contingency tables and linear trend was used in tables with other configurations). In the univariate model, the chi-square test assessed the association between independent variables and the dependent variable (non-participation in sports). Associations with *P*-value < 5% were selected to be included in the multivariable model using binary logistic regression (adjusted odds ratio [OR] and 95% confidence interval [95%CI]) and adjusted by potential confounders. Model-1 included sex and age as potential confounders; Model-2 included sex, age and level of education; and Model-3 included sex, age, level of education and current job. The significance level (*P*-value) was previously set at 5% and the statistical software BioEstat (version 5.0) was used for all analysis.

Results

The overall sample was composed of 743 participants (n_{men}= 288 [39%] and n_{women} = 455 [61%]; *P*-value = 0.001). Most participants were white (~83%) and completed at least high school (61.8%). 58.5% of the sample was overweight or obese (**Table 1**).

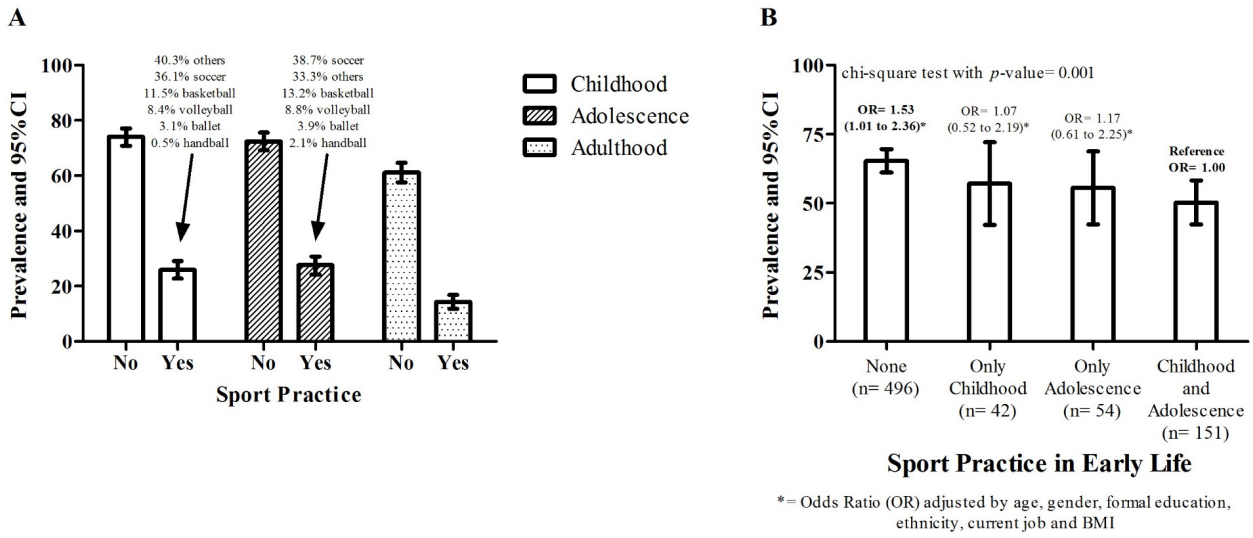
Table 1. Summary of the general characteristics of the sample.

Variables	General characteristics	
	n (%)	(% 95%CI)
Sex		
Male	288 (38.8)	(35.2 to 42.4)
Female	455 (61.2)	(57.7 to 64.7)
Age		
18-29.9 years	110 (14.8)	(12.2 to 17.3)
30-44.9 years	192 (25.8)	(22.6 to 28.9)
45-59.9 years	212 (28.5)	(25.2 to 31.7)
≥60 years	229 (30.9)	(27.5 to 34.1)
Ethnicity		
White	616 (82.9)	(80.2 to 85.6)
Black	83 (11.2)	(8.9 to 13.4)
Oriental	28 (3.8)	(2.4 to 5.1)
Other	16 (2.2)	(1.1 to 3.2)
Level of education		
< 4 years	155 (20.8)	(17.9 to 23.7)
5-8 years	129 (17.4)	(14.6 to 20.1)
High School	292 (39.3)	(35.7 to 42.8)
College or more	167 (22.5)	(19.4 to 25.4)
Current Job		
Yes	437 (58.8)	(55.2 to 62.3)
No	306 (41.2)	(37.6 to 44.7)
Overweight		
Normal weight	308 (41.5)	(37.9 to 45.1)
Overweight	260 (35.1)	(31.5 to 38.4)
Obesity	175 (23.4)	(20.5 to 26.6)
Sports participation		
Childhood	193 (26.1)	(22.8 to 29.1)
Adolescence	205 (27.6)	(24.3 to 30.8)
Adulthood	107 (14.4)	(11.8 to 16.9)

95%CI = 95% confidence interval

Sports participation during childhood and adolescence were reported by 26.1% and 27.6% of the sample, respectively (**Figure 1, Panel A**). Soccer was the most frequent sport reported in the childhood and adolescence periods of the participants of this study. Sports participation during adulthood was reported by 14.4%, while 24.5% were insufficiently active (<180min/week) and 61.1% reported no sports participation. A lack of sports participation during childhood and adolescence was associated with non-engagement in sports during adulthood (OR = 1.53 [1.01 to 2.36]) (**Figure 1, Panel B**).

Figure 1. Sports practice throughout life (**Panel A**) and association between sports practice in early life and adulthood (**Panel B**).



The non-participation in sports throughout life was an outcome highly observed (n = 435; 58.5% [95% CI = 55.1 to 62.1]) and it was associated with the females (OR = 2.42 [1.79 – 3.39]), higher age, the presence of a current job (OR = 2.06 [1.51 – 2.79]) and a lower level of education (OR = 7.59 [4.49 – 12.8]) in the crude model. On the other hand, overweight (*P*-value = 0.259) and ethnicity (*P*-value = 0.137) were not associated with non-engagement in sports (**Table 2**).

Table 2. Association between non-participation in sports throughout life and independent variables.

	Outcome: non-participation in sports throughout life		
	Chi-square test		**Logistic Regression**
Independent Variables	**n (%)**	*P* – value	**OR $_{crude}$ (OR$_{95\%CI}$)**
Sex		0.001	
Male	131 (45.5)		1.00
Female	304 (67)		2.42 (1.79 – 3.39)
Age		0.001	
18-29.9 years	34 (30.9)		1.00
30-44.9 years	98 (51)		2.33 (1.42 – 3.81)
45-59.9 years	132 (62.3)		3.68 (2.25 – 6.02)
≥ 60 years	171 (75.3)		6.82 (4.12 – 11.3)
Ethnicity		0.137	
White	355 (57.6)		1.00
Black	51 (61.4)		1.17 (0.73 – 1.87)
Oriental	16 (57.1)		0.98 (0.45 – 2.10)
Other	13 (81.3)		3.18 (0.89 – 11.2)
Level of education		0.001	
< 4 years	129 (83.2)		7.59 (4.49 – 12.8)
5-8 years	103 (79.8)		6.06 (3.56 – 10.3)
High School	137 (46.9)		1.35 (0.91 – 1.99)
College or more	66 (39.5)		1.00
Current Job		0.001	
Yes	225 (51.5)		1.00
No	210 (68.6)		2.06 (1.51 – 2.79)
Overweight		0.259	
Normal weight	178 (57.8)		1.00
Overweight	144 (55.4)		0.90 (0.65 – 1.26)
Obesity	111 (64.2)		1.30 (0.89 – 1.92)

OR = odds ratio; 95%CI = 95% confidence interval

In the multivariable model, the non-participation in sports throughout life remained associated with the female sex even after adjustment for potential confounders (OR = 2.41 [1.71 – 3.38]). Similar results were found regarding chronological age and lower level of education (5-8 years of formal education, OR = 5.28 [3.05 – 9.15]; ≤ 4 years of formal education, OR = 4.47 [2.45 – 8.17]). The multivariable model (Model – 3) had an adequate goodness-of-fit, which was assessed with the Hosmer and Lemeshow's test (*P*-value = 0.883) (**Table 3**).

Table 3. Multivariable models for the association between non-participation in sports throughout life and independent variables among adults.

Independent Variables	Model – 1 OR ($OR_{95\%CI}$)	Model – 2 OR ($OR_{95\%CI}$)	Model – 3* OR ($OR_{95\%CI}$)
Sex			
Male	1.00	1.00	1.00
Female	2.52 (1.83 – 3.47)	2.45 (1.75 – 3.42)	2.41 (1.71 – 3.38)
Age			
18-29.9 years	1.00	1.00	1.00
30-44.9 years	2.32 (1.40 – 3.86)	1.83 (1.08 – 3.10)	1.89 (1.11 – 3.22)
45-60 years	3.57 (2.16 – 5.90)	2.61 (1.55 – 4.41)	2.65 (1.57 – 4.48)
≥ 60 years	7.00 (4.17 – 11.7)	3.43 (1.92 – 6.13)	3.29 (1.82 – 5.94)
Level of education	---		
≤ 4 years	---	4.62 (2.55 – 8.39)	4.47 (2.45 – 8.17)
5-8 years	---	5.35 (3.09 – 9.27)	5.28 (3.05 – 9.15)
High School	---	1.39 (0.93 – 2.09)	1.37 (0.78 – 1.69)
College or more	---	1.00	1.00
Current Job	---	---	
Yes	---	---	1.00
No	---	---	1.15 (0.78 – 1.69)

* = Hosmer and Lemeshow test with P – value = 0.883; Model – 1= adjusted by sex and age; Model – 2 = adjusted by sex, age and formal education; Model – 3 = adjusted by sex, age, formal education and current job; OR = odds ratio; 95%CI = 95% confidence interval.

Discussion

This cross-sectional study identified that non-participation in sports during childhood can influence non-participation in sports during adulthood, which is significantly affected by sex, age and education level.

In our sample, non-participation in sports during the early years of life significantly affected sports participation or physical activity in adulthood. Longitudinal data showed that the amount of physical activity decreases from adolescence to adulthood, mainly for moderate-to-vigorous intensity physical activity,[13, 14] the most relevant type for the maintenance of health in adults. On the other hand, sports are usually incorporated into training routines performed at moderate-to-vigorous intensity, as well as it is performed expressively from childhood to adolescence[6] and from adolescence to adulthood.[7]

Older people report lower participation in sports in all periods of their lives.[11] In our study, 14.4% of the adults reached 180 min/week of participation in sports, a rate lower than observed in adults from England (41.2% among men and 33.9% among women in 2006).[15] However, it is worth mentioning that sports participation in England did not have a cutoff point, as did our study. Economic determinants of habitual physical activity are different in developed and developing nations. However, age is a factor that has a similar effect on physical activity patterns in both developing and developed settings, in which the elderly present higher levels of physical inactivity[10, 15]. Older people also reported lower engagement in sports during childhood and adolescence when compared to younger groups[10, 15]. To support these findings, national data show that most Brazilians didn't have access to sports while growing up, and when they did, it was usually soccer. This could explain why men are more likely to remain playing sports when compared to women[28].

Concerning these findings, it could be attributed to the effectiveness of governmental programs to promote physical activity/sports, which were initiated early in Europe and, therefore, their results can be verified in younger populations.[16] Moreover, the observed results confirm that physical inactivity in older adults should be a concern and a target for public health organizations worldwide.

In agreement with our data, early and currently engagement in sports was positively associated with the males[10] . The reasonable explanation for this finding seems to be in the higher support offered by the family nucleus for boys to engage in sports starting in the early years of life[17, 18] . It is rational to believe that this support influences behaviors related to sports participation in adulthood. Our findings are also similar to Howie, McVeigh, Smith, Straker[26], who reveal that teasing among girls, body image, feeling that sports are not feminine coupled with the stereotypes of sex roles in society, increases the participation of boys and the reduces the participation girls in sports or physical activity from an early age[26].

In our study, lower levels of education were associated with non-sports participation throughout life. In developing

countries, education and socioeconomic status are strongly related, and the positive relationship between physical activity and socioeconomic status is clear in the adult population (wealthier adults are more likely to be active in leisure-time and less active at work, while poorer adults are less active in leisure-time and more active at work). Moreover, wealthier people are surrounded by places with more facilities to practice physical activity/sports[19]. Furthermore, the demand for sports participation is significantly affected by financial variables (price payed for these activities)[20].

Regarding the relationship between economic status and sports participation, unemployment is a condition that acts as a barrier, limiting the individual to engage in exercise/sports[26]. Howie, McVeigh, Smith, Straker[26] emphasize that strategies for engaging people in physical activity/sports programs are necessary, and public policy should support or create awareness that sports participation does not need sophisticated places to happen, and its health benefits are valuable[26].

It is plausible to believe that the poorest children who are not practicing sports (poorer boys and girls have less access to sport facilities and devices) would have a higher likelihood of becoming inactive adults. Stalsberg and Pedersen[21], in a systematic review, identified a relationship between socioeconomic status and physical activity in adolescents, but the inconsistency of the methods to measure these variables in their research limits a clear understanding of the issue. In fact, more studies about this subject are necessary to understand clearly "how"/"why" this association happens, but apparently socioeconomic status plays a significant role in the maintenance of physical activity levels from childhood to adulthood. Therefore, this specific finding highlighted the relevance of actions promoting sports participation/physical activity in groups of lower economic status, independent of age.

Limitations must be recognized. Errors in recollection may occur when assessing sports participation in early life. The different criteria used to determine non-participation in sports in childhood/adolescence and adulthood are also a limitation, as well as sample size randomization and calculation, which did not consider demographic data. Moreover, our pilot study identified moderate-to-high reproducibility for early sports participation.

Conclusion

In summary, we found significant association between non-participation in sports during the early years of life and non-participation in sports during adulthood. Moreover, our study identified a high occurrence of non-participation in sports throughout life, which seems to be a relevant public health problem among women, older people and people with lower economic status.

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