DOI: 10.1590/1809-4503201400040012

ORIGINAL ARTICLE / *ARTIGO ORIGINAL*

Perceived neighborhood environment and physical activity among high school students from Curitiba, Brazil

Ambiente do bairro percebido e atividade física entre estudantes do ensino médio de Curitiba, Brasil

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ABSTRACT: ***Objective:*** To analyze the association between perceived neighborhood environment and physical activity (PA) in high school students from Curitiba (PR), Brazil. ***Methods:*** A sample of 1,611 high school students from public schools was surveyed. The PA was assessed through questions, engaged for at least 20 minutes or 60 minutes. Perceptions on neighborhood environment were assessed through ten questions about neighborhood characteristics. Gender, age and number of cars in the household were self-reported and used as confounding variables. Absolute and relative frequencies were used in the sample, and associations were tested through adjusted logistic regressions for the confounding variables and stratified by gender ($p < 0.05$). ***Results:*** The adjusted analyses showed that the variables "interesting things" among girls (OR = 1.77; 95%CI 1.05 – 2.96) and "there are places I like" (OR = 2.18; 95%CI 1.33 – 3.58) and "I see people my age", among boys, were associated with PA of at least 20 minutes/day once a week. Additionally, among boys, "I see people my age" was associated with 60-minute (OR = 1.68; 95%CI 1.15 – 2.45). Perceiving the neighborhood environment as "very good" was associated with higher chances of taking up PA among girls (OR = 1.92; 95%CI 1.15 – 3.22) and boys (OR = 3.13; 95%CI 1.97 – 4.97). ***Conclusion:*** A positive perception of the environment was associated to PA practice among boys and girls in this sample. The results suggest that some environmental characteristics which make neighborhoods more attractive could be related to PA among adolescents.

Keywords: Environment. Perception. Physical Activity. Motor Activity. Public Health. Adolescent.

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Conflict of interests: nothing to declare – **Financial support:** none.

RESUMO: ***Objetivo:*** Analisar a associação entre percepção do ambiente do bairro e prática de atividade física em estudantes do ensino médio da cidade de Curitiba (PR). ***Métodos:*** Foram avaliados 1.611 estudantes do ensino médio da rede pública. A atividade física foi analisada por questionário, avaliando a atividade física por no mínimo 20 minutos ou 60 minutos. A percepção do ambiente foi avaliada através de dez questões referentes às características do bairro. As variáveis sexo, idade e número de carros foram autorrelatadas e usadas como variáveis de confusão. Utilizou-se a distribuição de frequência absoluta e relativa, e as associações foram testadas por meio da regressão logística ajustada para as variáveis de confusão e estratificada por sexo ($p < 0,05$). ***Resultados:*** As análises ajustadas demonstraram que, para atividade física de 20 minutos, a variável "tem coisas interessantes" apresentou associação entre as meninas (OR = 1,77; IC95% 1,05 – 2,96) e as variáveis "existem locais de que gosto" (OR = 2,18; IC95% 1,33 – 3,58) e "vejo pessoas da mesma idade" (OR = 1,95; IC95% 1,13 – 3,37) entre os meninos, sendo a última também associada com atividade física de 60 minutos (OR = 1,68; IC95% 1,15 – 2,45). Meninas que perceberam o ambiente como "muito bom" apresentaram maior chance de praticar atividade física (OR = 1,92; IC95% 1,15 – 3,22), assim como meninos que relataram o bairro como "muito bom" apresentaram maior chance de praticar atividade física (OR = 3,13; IC95% 1,97 – 4,97). ***Conclusão:*** A percepção positiva do ambiente teve associação com a prática de atividade física de meninos e meninas nesta amostra. Os resultados sugerem que algumas características ambientais que tornem o bairro mais atrativo podem estar relacionadas com atividade física entre adolescentes.

Palavras-chave: Ambiente. Percepção. Atividade Física. Atividade Motora. Saúde Pública. Adolescente.

INTRODUCTION

The regular practice of physical activity (PA) has been recommended for people all ages due to its beneficial effects on health[1]. Such effects are also observed in both physical[2] and mental health[3] of children and adolescents. Despite that, a great proportion of young people have low levels of PA[4]. Evidence suggest that the physically active behavior in adolescence tends to be continued in adulthood[5].

In this sense, the understanding of the factors which influence PA among adolescents is important in order to develop intervention strategies which maintain or attenuate the declines observed at this age[6]. Several studies have been trying to understand the correlates and determinants of PA among adolescents, in order to increase the effectiveness of programs and interventions on the promotion of PA among teenagers[7].

Practicing PA demands spaces and specific facilities, therefore the study of the natural and built up environments' characteristics is important in the understanding of how much those are able to stimulate or inhibit PA[8,9]. In fact, there is an increasing number of studies assessing the relations between environment and youngsters' PA[10]. Among teenagers, it is believed that the influence of the social and built up environments is also important[11,12], once they are subjected to social standards or rules (parents' authorization

or friends' invitations, for example) which may interfere on their access to a number of locations, including places intended for PA practicing. For example, adolescents who live in more insecure regions, in terms of crime incidence, and with higher social disorder[13] or the ones living far from parks and recreational facilities[14] are less active than teenagers who live in safer places and close to parks. However, there is basically no evidence of this relation in countries of low or medium incomes. In Brazil, two large studies carried out in capitals do not present a direct relation between safety perception and PA practice. Nevertheless, the same studies show that observing people their own age practicing PA in the neighborhood and noticing the existence of places they like near their home (♂ OR = 1.96; 95%CI 1.40 – 2.78 and ♀ OR = 1.33; 95%CI 1.10 – 1.74)[15] and the presence of people their own age (♀ OR = 1.8; IC95% 1.3 – 2.4) are associated to PA practice[16].

However, in addition to being limited and few studies, the results available up until now show inconsistency as to their findings. Thus, given the need for broadening the knowledge on PA correlates among Brazilian adolescents and the neraly inexistence of studies on which environmental characteristics are related to PA in this age group, this study aims at analyzing the association between the characteristics perceived in the neighborhood environment and the practice of PA among high school students in the city of Curitiba (PR).

METHODS

This study is characterized as a school-based cross-sectional survey. The data were collected between March and May 2006, in Curitiba (PR), as a part of the project *"Determinantes da atividade física e obesidade em escolares do ensino médio da rede pública da cidade de Curitiba (PR), Brasil"* ("Determinants of physical activity and obesity among high school students from public schools in Curitiba (PR), Brazil").

According to the *Secretaria Estadual de Educação do Paraná*, in 2006 (year when the data were collected), there was a municipal population of 42,563 student adolescents in public schools, studying during daytime. In order to estimate the size of the sample, there were considered a sampling error of three percentage points, a estimated prevalence for PA practice at recommended levels of[1] 50%, a design effects of 1.5, a confidence interval of 95% and an additional 10% for eventual losses and refusals. Based on these criteria, we reached a minimum sample of 1,609 adolescents. The final sample consisted of 1,611 high school students. The sample size, calculated *a posteriori*, allows the detection of associations of higher chance at 1.15 with minimum power of 87% for an alpha value of 5%. For this, the G*Power software, version 3.1.3, was used. In order to obtain a representative sample, we used a process of cluster proportional selection in two stages. In the first one, it was established the proportion of students according to the number of enrollments in each one of the nine administrative regions of Curitiba. Schools were selected randomly (n = 14) so that the number of students would meet the desired proportion for each region. In the second stage, the proportion of students in each one of the three high school grades in the regions was

determined. School classes, with enough students to meet the desired number of students per grade, were randomly selected (n = 62) within the participant schools.

For the collection of the data, a questionnaire previously developed and validated for the evaluation of the perceived environment among American adolescents[17]; however, it was translated and adapted into Portuguese and it presented adequate reliability values. For the present study, the Portuguese version was used in a group of teenagers in order to test the clarity and understanding of the items[18]. Its use was carried out inside the classroom, during Physical Education class, and guided by interviewers who were trained for such.

In order to assess the overall PA, we used the question adopted by the Youth Risk Behavior Surveillance System[19]. This measure has already been used in Brazilian studies[20] and it presents acceptable elevated reproducibility values (Interclass Correlation R = 0.87; 95%CI 0.81 – 0.91) and concurrent validity[21]. The teenagers who reported practicing PA five or more days a week for at least 60 minutes were classified as active, corresponding to the most recent PA recommendations among youngsters[1]. Once the perceived environment variables may present several forms of association for different PA levels[22], a question was used in order to identify the adolescents who take up any PA for at least 20 minutes at least once a week. This question has also been used in surveys of national coverage with American teenagers[23].

The perception of the neighborhood environment was assessed by tem questions on the characteristics of the neighborhood in which the teenager lives, based on the items of the module of perceived environment assessment[17]. The processes of translation, clarity and reliability were previously performed in a pilot study with Portuguese adolescents[24]. For this study, the translated version was used in a group of teenagers in order to assess its clarity and understanding, and there was no need for further adaptations. The questions used were: "there are many places I like", "Most streets have sidewalks", "there are biking tracks or walking trails", "taking a walk or playing is safe in my neighborhood", "it is easy to see people walking", "there is so much traffic it is difficult to take a walk", "there are too many crimes", "I always see people my age playing or exercising", "There are a lot of interesting things to be seen when I take a walk", "the streets are well lit at night". The response options consisted of four categories ("I strongly disagree", "I disagree", "I agree" and "I strongly agree").

Two strategies were adopted for the analysis. First, the association between each question on the environment and the study's outcomes (PA) were analyzed and, for such, the answers were grouped in "I agree" (including the options "I agree" and "I strongly agree") and "I disagree" ("I disagree" and "I strongly disagree"). Then, the overall perception on the characteristics of the neighborhood were analyzed considering all questions, having assigned values between 1 (I strongly disagree) and 4 (I strongly agree), with a final score varying from 10 (minimum) to 40 (maximum) points. In order for the highest score to represent the best environmental perception, the questions "there is so much traffic it is difficult to take a walk" and "there are too many crimes" had their scores inverted. The final result was named "Overall perception of the neighborhood environment", which was categorized: "very bad", "bad", "good" and "very good".

The variables gender, age, weight, height, mother and father school education and the number of cars in the house were self-reported and used as potential confounding variables. Weight and height were used in order to calculate the body mass index (BMI). For this classification, we used the cutoff point derived from the Brazilian population[25] to define the classes "average weight" (low and normal weight) and "excess of weight" (overweight and/or obesity). The highest parental school education (father or mother) was used considering the highest of the three categories: complete elementary school (parents with no school education or complete elementary education, at best), complete high school education (parents who finished high school or who have incomplete college education) and complete college education (parents who, at least, finished their college education). The number of cars in the house was grouped into four categories (none; one; two; and three or more cars).

For the description of the participants in the study, the distribution of absolute and relative frequencies was used, comparing both gender using the χ^2 test for proportions. Potential confounding variables were identified according to the criteria suggested in literature: 1) to be associated with the dependent variable within the "exposure" levels; 2) to be associated to the exposure and 3) not to be an "effect" of the "exposure" (independent variable)[26]. Similar studies have identified, yet, that the factors associated to PA differ significantly between genders[15], therefore it was chosen to conduct the stratifies analyses according to the gender.

The relation between the variables of perceived neighborhood environment and the practice of PA was analyzed according to two outcomes (to exercise at least 20 minutes a day/week and to fulfill the recommendation of 60 minutes of PA at least Five days/week) through binary logistic regressions stratified by gender. The raw model was obtained through the analysis of neighborhood environmental factors with PA (for both outcomes); then, for the adjusted model, the relation between each environmental variable and the PA was analyzed, considering the confounding variables, specifically for outcomes and strata (gender). Finally, besides the confounding variables, all factors of neighborhood environment perception statistically related to PA were inserted in a third model of analysis. Such analyses were carried out by the statistical softwares SPSS 17.0 and STATA 9.2 and the significance level was kept at 5%. Considering it is a cluster sample, the correction for the design effect was performed through the "svy" command for the analysis of data from complex samples.

The research was approved by the Research Ethics Committee of the *Pontifícia Universidade Católica do Paraná* (CEP-PUCPR, No. 1076/2006) and the protocols followed the recommendations by the National System of Research Ethics.

RESULTS

The characteristics of the studied sample are presented in Table 1. Most part of the sample consisted of girls (59.7%), with largest proportion of teenagers, in both gender, it is in a similar and concentrated age range between 15 and 17 years of age (84.0%). Largely, adolescents reported that the highest parental school education was complete high school

Table 1. Distribution of participants by sex, according to selected variables (n = 1.611).

Variable		Total n (%)	Female n (%)	Male n (%)	p-value
Gender		1.611 (100.0)	961 (59.7)	650 (40.4)	
Age (years)	14	92 (5.7)	60 (6.2)	32 (4.9)	0.26
	15	400 (24.8)	250 (26.0)	150 (23.1)	
	16	543 (33.7)	326 (33.9)	217 (33.4)	
	17	442 (27.4)	252 (26.2)	190 (29.2)	
	18	134 (8.3)	73 (7.6)	61 (9.4)	
Parents' school education	Until complete elementary school	478 (29.7)	321 (33.4)	157 (24.2)	< 0.01
	Complete elementary school	650 (40.4)	366 (38.1)	284 (43.7)	
	Complete high school	483 (30.0)	274 (28.5)	209 (32.2)	
Number of cars	None	394 (24.5)	252 (26.2)	142 (21.9)	0.05
	1	789 (49.0)	474 (49.3)	315 (48.5)	
	2	322 (20.0)	181 (18.8)	141 (21.7)	
	3 or more	106 (6.6)	54 (5.6)	52 (8.0)	
There are places I like	Disagree	566 (35.1)	369 (38.4)	197 (30.3)	< 0.01
	Agree	1.045 (64.9)	592 (61.6)	453 (69.7)	
Streets have sidewalks	Disagree	590 (36.6)	372 (38.7)	218 (33.5)	0.04
	Agree	1.021 (63.4)	589 (61.3)	432 (66.5)	
There are biking tracks	Disagree	906 (56.2)	568 (59.1)	338 (52.0)	0.01
	Agree	705 (43.8)	393 (40.9)	312 (48.0)	
It is safe	Disagree	852 (52.9)	576 (59.9)	276 (42.5)	< 0.01
	Agree	759 (47.1)	385 (40.1)	374 (57.5)	
I see people taking a walk	Disagree	963 (59.8)	596 (62.0)	367 (56.5)	0.03
	Agree	648 (40.2)	365 (38.0)	283 (43.5)	
There is too much traffic	Disagree	1.286 (79.8)	749 (77.9)	537 (82.6)	0.02
	Agree	325 (20.2)	212 (22.1)	113 (17.4)	
There are too many crimes	Disagree	854 (53.0)	517 (53.8)	337 (51.9)	0.44
	Agree	757 (47.0)	444 (46.2)	313 (48.2)	

Continue...

Table 1. Continuation.

Variable		Total n (%)	Female n (%)	Male n (%)	p-value
I see people my own age	Disagree	696 (43.2)	481 (50.1)	215 (33.1)	< 0.01
	Agree	915 (56.8)	480 (50.0)	435 (66.9)	
There are interesting things	Disagree	1.011 (62.8)	629 (65.5)	382 (58.8)	0.01
	Agree	600 (37.2)	332 (34.6)	268 (41.2)	
Well lit streets	Disagree	899 (55.8)	552 (57.4)	347 (53.4)	0.11
	Agree	712 (44.2)	409 (42.6)	303 (46.6)	
Overall neighborhood environment perception	Very bad (Qi1)	416 (25.8)	287 (29.9)	129 (19.9)	< 0.01
	Bad	433 (26.9)	265 (27.6)	168 (25.9)	
	Good	319 (19.8)	187 (19.5)	132 (20.3)	
	Very good (Qi4)	443 (27.5)	222 (23.1)	221 (34.0)	
PA 20 minutes	Does not do	276 (17.1)	219 (22.8)	57 (8.8)	< 0.01
	Does*	1.335 (82.9)	742 (77.2)	593 (91.2)	
PA 60 minutes	Inactive/ Insuficiently active	1.379 (85.6)	871 (90.6)	508 (78.2)	< 0.01
	Active**	232 (14.4)	90 (9.4)	142 (21.9)	

*practices PA at least 20 minutes, once a week **practices PA at least 60 minutes, 5 days a week; PA: physical activity.

level and that they possess at least one family car. Also, most participants reported that, in their neighborhood, there are places they like (64.9%), There are sidewalks (63.4%) and biking tracks (56.2%) and safety is perceived as positive (52.9%). The "overall neighborhood environment perception" as "very good" was more frequent among boys (34.0% considered it to be "very good") when compared to girls (23.1%). Finally, most part of the participants (82.9%) take part in some PA (at least 20 minutes in one day/week), though only 14% of them classify within the recommendation for PA practice with benefits to health (60 minutes at least five days/week). In general, the proportion of active boys was higher than the one of girls for both PA outcomes (91.2 *versus* 82.9%; 21.9 *versus* 9.4%, respectively).

In Table 2, the analyses of the raw and adjusted associations between the perceived environment variables and the PA for boys and girls are presented, following the 20-minute PA criterion. Among girls, the only neighborhood environment variable which remained in the final model, after the adjustment of the remaining variables, was "there are interesting things in my neighborhood" (OR = 1.77; 95%CI 1.05 – 2.96). Among boys, the variables "There are places I like in my neighborhood" (OR = 2.18; 95%CI 1.33 – 3.58) and "I see

Table 2. Factors associated with the practice of 20-minute physical activity among high school students.

		Girls			Boys			
		n (%)	Crude OR (95%CI)	Adjusted* OR (95%CI)	n (%)	Crude OR (95%CI)	Adjusted* OR (95%CI)	Adjusted** OR (95%CI)
There are places I like	Disagree	280 (75.9)	1.00		167 (84.8)	1.00	1.00	1.00
	Agree	462 (78.0)	1.13 (0.75 – 1.69)		426 (94.0)	2.83 (1.81 – 4.43)	2.63 (1.58 – 4.40)	2.18 (1.33 – 3.58)
Streets have sidewalks	Disagree	278 (74.7)	1.00		201 (92.2)	1.00	1.00	
	Agree	464 (78.8)	1.26 (0.84 – 1.89)		392 (90.7)	0.83 (0.59 – 1.16)	0.79 (0.55 – 1.12)	
There are biking tracks	Disagree	445 (78.4)	1.00		304 (89.9)	1.00	1.00	
	Agree	297 (75.6)	0.86 (0.61 – 1.20)		289 (92.6)	1.41 (0.79 – 2.49)	1.35 (0.79 – 2.30)	
It is safe	Disagree	442 (76.7)	1.00		244 (88.4)	1.00	1.00	1.00
	Agree	300 (77.9)	1.07 (0.81 – 1.41)		349 (93.3)	1.83 (1.33 – 2.52)	1.73 (1.20 – 2.51)	1.21 (0.77 – 1.90)
I see people taking a walk	Disagree	448 (75.2)	1.00	1.00	332 (90.5)	1.00	1.00	
	Agree	294 (80.6)	1.37 (1.04 – 1.80)	1.26 (0.97 – 1.64)	261 (92.2)	1.25 (0.92 – 1.70)	1.24 (0.90 – 1.71)	
There is too much traffic	Disagree	582 (77.7)	1.00		496 (92.4)	1.00	1.00	1.00
	Agree	160 (75.5)	0.88 (0.61 – 1.28)		97 (85.8)	0.50 (0.28 – 0.89)	0.51 (0.28 – 0.93)	0.50 (0.24 – 1.01)

Continue...

Table 2. Continuation.

		Girls			Boys			
		n (%)	Crude OR (95%CI)	Adjusted* OR (95%CI)	n (%)	Crude OR (95%CI)	Adjusted* OR (95%CI)	Adjusted** OR (95%CI)
There are too many crimes	Disagree	403 (78.0)	1.00		309 (91.7)	1.00	1.00	
	Agree	339 (76.4)	0.91 (0.62 – 1.35)		284 (90.7)	0.89 (0.42 – 1.88)	0.90 (0.42 – 1.91)	
I see people my own age	Disagree	360 (74.8)	1.00		184 (85.6)	1.00	1.00	1.00
	Agree	382 (79.6)	1.31 (0.98 – 1.75)		409 (94.0)	2.65 (1.72 – 4.09)	2.37 (1.51 – 3.71)	1.95 (1.13 – 3.37)
There are interesting things	Disagree	464 (73.8)	1.00	1.00	341 (89.3)	1.00	1.00	
	Agree	278 (83.7)	1.83 (1.08 – 3.09)	1.77 (1.05 – 2.96)	252 (94.0)	1.89 (0.99 – 3.60)	1.82 (0.91 – 3.65)	
Well lit streets	Disagree	418 (75.7)	1.00		318 (91.6)	1.00	1.00	
	Agree	324 (79.2)	1.22 (0.89 – 1.68)		275 (90.8)	0.90 (0.72 – 1.12)	0.87 (0.66 – 1.14)	
Overall neighborhood environment perception	Very bad	211 (73.5)	1.00		111 (86.1)	1.00	1.00	
	Bad	203 (76.6)	1.18 (0.84 – 1.66)		150 (89.3)	1.35 (0.82 – 2.23)	1.28 (0.77 – 2.14)	
	Good	141 (75.4)	1.10 (0.75 – 1.62)		121 (91.7)	1.78 (1.04 – 3.05)	1.51 (0.93 – 2.45)	
	Very good	187 (84.2)	1.92 (1.15 – 3.22)		211 (95.5)	3.42 (2.33 – 5.03)	3.13 (1.97 – 4.97)	

*adjusted for confounding variables: cars per family and age **adjusted for significant variables on crude analysis.

people my age practicing PA" (OR = 1.95; 95%CI 1.13 – 3.37) remained associated to PA in the final model. The "overall neighborhood environment perception" remained associated to PA for both girls (OR = 1.92; 95%CI 1.15 – 3.22) and boys (OR = 3.13; 95%CI 1.97 – 4.97)

In Table 3 we presented the results of the association between PA practice at recommended levels and the neighborhood environment perception, according to gender. Among girls, there were no associations for any of the environmental variables, while among boys only the variable "I see people my age practicing PA" remained associated to the final model (OR = 1.68; 95%CI 1.15 – 2.45). No associations to the indicator "overall neighborhood perception" were observed for either gender.

DISCUSSION

This was one of the first studies to identify the environmental correlates among adolescents in Brazil and one of the few in Latin America. The probabilistic sampling allowed inferring to the population of public schools of the city and had enough power to detect relatively small effects. Still, the analyses were stratified between boys and girls, enabling gender-specific applications. Besides that, the confounding variables were properly tested and applied according to the normative criteria, not limited only to what has been suggested in the literature. At last, two distinct cutoff points were used, allowing the identification of variables which may contribute so that teenagers do "some/any" physical activity and achieve the recommended activity levels, making this study more applicable into reality.

However, some limitations ought to be considered for the interpretation of this study's results. Its cross-sectional design does not allow identifying the sense of the observed associations, and therefore, the adolescents may have presented better perception of their environment as a result of the increased levels of PA. The PA practice was assesses by a widely used overall measure with adequate psychometric properties[27], though it does not detail the domain (leisure or transportation) in which it is performed, neither its intensity, characteristics which are related in different ways to the environment[7]. In addition to that, the instrument used in order to assess the environmental characteristics perception was originally developed for adults and, although it has been translated, adapted, tested and previously applied to[17], it may not allow the assessment of important environmental characteristics for teenagers. Despite the sample's size and design, only students from the public educational system were assessed, making it impossible to broaden the result data over all population. Also, the possible effects of negative confounding were not taken into consideration in the adjusted model.

The present study showed that the perception on neighborhood environment is different between genders, being more positive among boys rather than among girls. The neighborhood environment perception had higher association to PA practice (at least 20 minutes of PA one day/wee) when compared to the recommended

Table 3. Factors associated with the practice of 60-minute physical activity on high school students.

		Girls		Boys			
		n (%)	Crude OR (95%CI)	n (%)	Crude OR (95%CI)	Adjusted* OR (95%CI)	Adjusted** OR (95%CI)
There are places I like	Disagree	34 (9.2)	1.00	37 (18.8)	1.00	1.00	
	Agree	56 (9.5)	1.03 (0.65 – 1.63)	105 (23.2)	1.30 (0.96 – 1.78)	1.29 (0.94 – 1.77)	
Streets have sidewalks	Disagree	38 (10.2)	1.00	44 (20.2)	1.00	1.00	
	Agree	52 (8.8)	0.85 (0.51 – 1.43)	98 (22.7)	1.16 (0.67 – 2.01)	1.13 (0.65 – 1.98)	
There are biking tracks	Disagree	50 (8.8)	1.00	69 (20.4)	1.00	1.00	
	Agree	40 (10.2)	1.17 (0.66 – 2.09)	73 (23.4)	1.19 (0.76 – 1.86)	1.20 (0.78 – 1.85)	
It is safe	Disagree	53 (9.2)	1.00	56 (20.3)	1.00	1.00	
	Agree	37 (9.6)	1.05 (0.74 – 1.49)	86 (23.0)	1.17 (0.78 – 1.77)	1.20 (0.79 – 1.82)	
I see people taking a walk	Disagree	61 (10.2)	1.00	73 (19.9)	1.00	1.00	
	Agree	29 (7.9)	0.76 (0.42 – 1.35)	69 (24.4)	1.30 (0.86 – 1.96)	1.28 (0.85 – 1.91)	
There is too much traffic	Disagree	67 (8.9)	1.00	119 (22.2)	1.00	1.00	
	Agree	23 (10.8)	1.24 (0.67 – 2.30)	23 (20.3)	0.90 (0.54 – 1.51)	0.90 (0.54 – 1.52)	

Continue...

Table 3. Continuation.

		Girls		Boys			
		n (%)	Crude OR (95%CI)	n (%)	Crude OR (95%CI)	Adjusted* OR (95%CI)	Adjusted** OR (95%CI)
There are too many crimes	Disagree	51 (9.9)	1.00	83 (24.6)	1.00	1.00	
	Agree	39 (8.8)	0.88 (0.52 – 1.48)	59 (18.8)	0.71 (0.48 – 1.06)	0.74 (0.49 – 1.10)	
I see people my own age	Disagree	45 (9.4)	1.00	35 (16.3)	1.00	1.00	1.00
	Agree	45 (9.4)	1.00 (0.68 – 1.48)	107 (24.6)	1.68 (1.16 – 2.43)	1.68 (1.15 – 2.45)	1.68 (1.15 – 2.45)
There are interesting things	Disagree	60 (9.5)	1.00	74 (19.4)	1.00	1.00	
	Agree	30 (9.0)	0.94 (0.61 – 1.45)	68 (25.4)	1.42 (0.82 – 2.45)	1.43 (0.82 – 2.50)	
Well lit streets	Disagree	51 (9.2)	1.00	73 (21.0)	1.00	1.00	
	Agree	39 (9.5)	1.04 (0.57 – 1.87)	69 (22.8)	1.11 (0.69 – 1.77)	1.10 (0.68 – 1.77)	
Overall neighborhood environment perception	Very bad	31 (10.8)	1.00	25 (19.4)	1.00	1.00	
	Bad	19 (7.2)	0.64 (0.32 – 1.27)	30 (17.9)	0.90 (0.45 – 1.84)	0.89 (0.43 – 1.83)	
	Good	20 (10.7)	0.99 (0.57 – 1.72)	30 (22.7)	1.22 (0.77 – 1.96)	1.20 (0.74 – 1.96)	
	Very good	20 (9.0)	0.82 (0.47 – 1.43)	57 (25.8)	1.45 (0.75 – 2.77)	1.40 (0.73 – 2.68)	

*adjusted for confounding variables: parents scholar degree **adjusted for significant variables on crude analysis.

PA practice (60 minutes of PA at least five days/week). Also, greater amounts of environment perception variables were associated to higher PA practice among boys when compared to girls.

In general, PA practice among girls seems not to relate to isolated environmental characteristics[28]. In this study, only one out of the ten questions ("there are interesting things to see") on the environment was associated to the practice of a PA among girls, which is corroborated by a study conducted in Portugal with teenagers of the same age range[24]. However, the measure of the overall neighborhood environment perception was more strongly associated to PA practice in lower volumes, once no association to the practice PA at recommended levels were observed. This result was not observed was not observed as well in another study conducted in Brazil (João Pessoa), in which girls who reported having interesting things to see, places they liked and to see other adolescents practicing physical activities presented higher probability of recommended PA[20]. Local characteristics may contribute to this inconsistency of the findings. For example, Curitiba presents elevated residential density, amount of squares and green areas and structures for PA, resulting in higher availability of places for this practice[29], which diminishes the variability of the exposure variable. On the other hand, studies carried out in the same population group showed that the environmental barriers are the least reported ones[29] and they did not associate with PA[30], among girls. Therefore, at least among girls, the environment may be considered a factor against the their relationship with PA when compared to individual and psychological variables[30].

Among boys, "places they like", "seeing people their same age" and the overall measure of environment perception were associated to the practice of a PA. In a review study, when analyzed the relation of environment perception measures and the self-reported PA, 29% of all comparisons were significant and, although none of the environment variables have been strongly related to PA, important factors, such as Access to recreational equipments and the presence of sidewalks and biking tracks, are somehow associated[10].

When we analyze the recommended levels of PA practice among boys, the only variable which did not present significant association was "seeing people their own age", also associated among teenagers from João Pessoa[20]. This result reinforces the importance of having partners, for boys, in the places they practice PA, evidencing greater influence of the social environmental characteristics in relation to the physical relations in the practice of PA. In a study performed in Rotterdam (Netherlands), on the other hand, when assessing moderate levels of PA, it was found an association between the perception of parks and squares and the practice of strolling or biking as a PA during leisure time, and also between the perception of public sports spaces and the practice of these activities at least three times a week[31].

Curiously, safety, traffic and criminality did not represent significant association for both gender and PA criteria, similar to what was observed in Portugal[24]. Pizarro found

that a possible explanation for the non-association between PA as na active means of transportations and the safety of the neighborhood is the fact that teenagers do not have another option, considering the irrelevant perception of safety in this context[32]. However, there are differences between the results of studies carried out in different countries[32,33], which may be explained by contextual aspects, such as the difference in criminality rates between high, medium and low income countries, or even methodological matters (for example, the low quality of safety measures).

CONCLUSION

A great proportion of adolescents do not meet the recommendation for PA practice. It is also concluded that the environment characteristics are related specially to the practice of some kind of PA and are less consistent when regarding recommended levels. Therefore, it is possible that the environment perceived aspects may be important in the practice of a PA, which is better than practicing no PA at all[34]. Both the social environment characteristics and the physical environment are positively associated to the practice of a PA in general, though in a more inconsistent way between gender and in a more relevant way for boys when compared to girls.

These findings confirm that the perception of some environment factors may be important for teenagers' PA practicing, and it should be considered when analyzing the connections between urban planning and health in populations of various age range. Tools and strategies have been suggested in order to include evidence on this relation for the implementation of policies and changes within the urban environment[35]. Such information must be employed in urban planning involving systems of public transportation, parks, squares and biking tracks, making these locations rather attractive as meeting points for adolescents in PA practice.

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Received on: 02/27/2013
Final version presented on: 07/16/2013
Accepted on: 08/12/2013