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Associations Between Self-Rated Health With Cardiorespiratory Fitness and Obesity Status Among Adolescent Girls

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Background: The main goal of this study was to analyze the associations between cardiorespiratory fitness (CRF) and body mass index (BMI) with self-rated health (SRH) of adolescent girls. ***Methods:*** This was a cross-sectional study of 533 adolescents girls, aged from 10 to 18 years old. CRF was predicted by maximal multistage 20-m shuttle-run test according to procedures described from FITNESSGRAM. Girls' obesity status was classified according to International Obesity Task Force and Self-rated health (SRH) was assessed by questionnaire. ***Results:*** The findings showed that among adolescent girls 23.2% had negative SRH. Girls who were classified as unfit were more likely to report negative SRH in both univariate logistic (OR: 3.05; CI: 1.91–4.87; $P < .05$) and multivariate (OR: 2.93; CI: 1.82–4.72; $P < .05$) regression analyses compared with their fit peers. Obese girls were more likely to report negative SRH (OR: 2.30; CI: 1.14–4.62; $P < .05$) compared with their normal-weight counterparts. However such association was lost in multivariate analyses suggesting an effect of CRF. ***Conclusions:*** Negative perception of health was associated with lower CRF and weight status although such association it is mediated by CRF condition.

Keywords: youth, female, cardiovascular condition, body mass index

Physical inactivity and a lack of physical fitness, namely cardiorespiratory fitness (CRF), have been associated with increased risk of several cardiovascular and metabolic diseases in youth, such as lipid disorders, high blood pressure, and insulin resistance among others.[1,2] Likewise, CRF is an outcome of physical activity and an important component of metabolic health and therefore provides a useful and objective endpoint to examine the health-related effects of sedentariness.[3] Furthermore, the prevalence of pediatric obesity has increased globally over the past 20 years[4] and higher rates of overweight/obesity have been described in Portuguese youth.[5] In addition in the pediatric population, overweight/obese children and adolescents are at increased risk for developing metabolic complications and cardiovascular disease (CVD) risk factors early in life.[6,7]

However, while all these factors were associated with several health-related biological and metabolic outcomes in youth; the association with perceptions of overall health are scarce and deserve some more research attention. Self-rated health (SRH) was suggested as a health indicator among adolescents[8] since SRH appears to be a function of adolescents' overall sense of functioning[9] and adolescent's health-related quality of life.[10] Further, SRH is a relatively stable construct during adolescence[11] and in adults was consistently associated with physical health status[12] as well as an important independent
This is a cross-sectional study carried out in middle and high schools comprising 553 girls registered in 7th until 12th grade (15.4 ± SD 1.9 years-old), during 2008 academic year. Girls that participated in this study were apparently healthy and free of medical treatment and they were living in Porto District. A letter informing families that students will be measured was sent home 2 weeks before measurements took place. Schools approved the study protocol and all parents signed an informed consent form. All measures were carried out by the same group. This study was conducted according to the guidelines of the Helsinki Declaration of Human Studies and was

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approved by the Portuguese Foundation for Science and Technology and by the Scientific Board of Physical Activity and Health PhD program. Written consent was required.

Anthropometric Measures

Body height was measured to the nearest millimeter in bare or stocking feet with the adolescent standing upright against a Holtain stadiometer. Weight was measured to the nearest 0.10 kg, lightly dressed, using an electronic weight scale (Seca 708 portable digital beam scale). Body mass index (BMI) was calculated from the ratio of body weight (kg) to body height (m^2) and organized using linear interpolation between the cut-off points according age and sex, as described by Cole et al.[14] Thus, for the purpose of this study Obesity Status were defined for 3 categories: 1) normal weight, 2) overweight, and 3) obesity.

Cardiorespiratory Fitness (CRF)

CRF was predicted by maximal multistage 20-m shuttle-run test according to procedures described from FITNESSGRAM.[15] The FITNESSGRAM uses criterion-referenced standards to evaluate fitness performance. The standards were established by the Cooper Institute for Aerobics Research to represent a level of fitness that offers some degree of protection against diseases that result from sedentary living. The FITNESSGRAM was selected because it's easy to administer to large numbers of subjects and its choice of reliable and valid health-related physical fitness measures.[15] The Shuttle Run Test predicted maximal aerobic capacity and showed significant correlation with VO_2max ($r = .80$) suggesting that it could be used as a measure of aerobic fitness in children.[16] Students were familiarized with the procedure for each test before recording data. Furthermore, the participants received verbal encouragements from the investigators to achieve maximum performance. The result was recorded as laps taken to complete the 20-m shuttle-run test. Children were then classified as fit (those who reached the minimum criteria for healthy Fitness Zone) and unfit (those who didn't) according to the age and sex-specific values.

Self-Rated Health (SRH)

Adolescents were asked to assess their health status by responding to the question: "In general, how would you rate your health?" Items are scored on a Likert scale with 1 = "poor" to 5 = "excellent." Following the general procedure applied in this study, the no risk vs. risk approach positive vs. negative, respectively. This measure was dichotomized into "positive SRH" (excellent, very good, and good answers) and "negative SRH" (fair and poor). The 2-week test-retest reliability score was $r = .86$. The use of a single-item measurement to assess SRH is consistent with most research involving this indicator of overall health status in adolescents.[14]

Statistics

Means and standard deviations were calculated to describe participants' characteristics. Descriptive statistics included the obesity status (normal weight, overweight, and obese) and CRF categories (unfit vs. fit) frequencies according to SRH groups. The chi-square test (χ^2) was used to determine the differences in the proportion of obesity status (BMI) and CRF according to SRH. A logistic regression analysis was performed to assess Odds Ratio (OR) and 95% confidence intervals (CI) for SRH (as dependent variable) with obesity status and CRF (as independent variables), separately. The final model of the multivariate logistic regression analysis was performed to assess OR and 95% confidence intervals (CI) for SRH with obesity status (BMI) and CRF.

Statistical analysis was performed using SPSS 15 software (SPSS Inc., Chicago, IL, USA) and Microsoft Excel 2000. The level of significance was set at $P \leq .05$.

Results

Table 1 shows the differences in descriptive variables as well as categories of SRH in CRF and obesity status according to SRH (positive vs. negative). Girls assigned to negative SRH group were significantly heavier ($P < .05$); they had higher BMI, showed poor performance in 20 m SRT test and had higher prevalence of obesity ($P < .05$ for all). However, girls reporting negative SRH were significantly more classified as unfit (74.3%) compared with their positive SRH (48.7%) peers.

Logistic regression analysis showed that obese girls had higher odds ratio (OR) to report negative SRH compared with those with normal weight girls (OR = 2.3; 95%CI: 1.1–4.6; $P = .019$) (Table 2). Logistic regression analysis showed that girls who were classified as unfit had higher odds ratio (OR) to report negative SRH compared with their fit peers (OR = 3.1; 95%CI: 1.9–4.9; $P = .000$) (Table 2).

The final model of the multivariate logistic regression analysis (Table 2) showed that girls who were classified as unfit were more likely (OR = 2.9; 95%CI: 1.8–4.7; $P = .000$) to report negative SRH compared with their fit peers, after adjusting for obesity status (BMI).

Discussion

This study aimed to analyze the associations between CRF and obesity status with SRH of adolescent girls. Despite the popularity of SRH as a useful public health tool[14] as well as a valid measure of health status,[17] there are few available data with regard the relationship between CRF and obesity status with SRH. Our data focused on adolescent girls. This seems to be a timely issue since female gender is a factor that appears to affect SRH in adolescents.[18,19] On the other hand, girls seem to be a key targeting group in health-related lifestyle promotion due to their low levels of physical activity[20] and CRF[21] compared with their male counterparts.

Table 1 Girls Obesity Status (BMI) and CRF Accomplishment of Healthy Fitness Zone (Fit or Unfit), According to SRH (Negative vs. Positive)

	Negative (n = 128) X ±SD	Positive (n = 425) X ±SD	*P*
Age (years)	15.0 ± 1.5	14.5 ± 2.4	0.420
Weight (kg)	56.6 ± 13.6	55.5 ± 11.1	**0.020**
Height (cm)	160.1 ± 7.1	159.5 ± 7.8	0.470
BMI (kg/h^2)	23.2 ± 4.6	21.7 ± 3.5	**0.001**
CRF (laps)	23.5 ± 10.8	28.9 ± 12.8	**<0.001**
BMI (%)			
Normal	71.8	71.9	**0.014**
Overweight	16.1	22.8	
Obese	12.1	5.3	
CRF(%)			
Fit	25.7	57.3	**<0.001**
Unfit	74.3	48.7	

Abbreviations: BMI, body mass index; CRF, cardiorespiratory fitness.

Table 2 Logistic Regression Analysis Showing CRF and Obesity Status (BMI) Associated With SRH (Self-Rated Health)

	Univariable effects [odds ratio (95% CI)]	*P*	Multivariable effects* [odds ratio (95% CI)]	*P*
Normal weight—REF				
Overweight	0.71 (0.42–1.21)	>0.05	0.77 (0.44–1.34)	>0.05
Obese	2.30 (1.14–4.62)	**0.019**	1.60 (0.72–3.57)	>0.05
Fit—REF				
Unfit	3.05 (1.91–4.87)	**<0.001**	2.93 (1.82–4.72)	**<0.001**

Our data showed that among adolescent girls 23.2% had negative SRH. The values reported are higher than those found in Asian adolescent girls (4.6%)[22] as well as in European and North American adolescent samples which reported that 8.2% girls were healthy.[23] Despite cultural background being associated to the total SRH variation between countries in which the percentage reporting 'not healthy' would fall between 2.5% and 23.2% for girls, our data raised some concerns about the sample health perception and further attention should be considered.

Further, and more importantly our findings showed that those who were classified as unfit were almost 3 fold more likely to report negative SRH compared with their fit peers. The data are in line with findings in Thai adolescents suggesting that compared with adolescent peers who rated their health as healthy or very healthy, poor adolescent SRH girls were less physically active.[22] Although the variability is great, young people classified as fit have tended to be more active.[24] Because many lifestyle habits are established during childhood and adolescence, physical activity and exercise habits may also be established during these formative years. This is particularly worthy in girls since they are usually described as less active than boys.[20,25] Further, different determinants were identified as significant risk factors of childhood obesity between genders, with low activity associated to obesity in girls.[26]

Although some studies indicate a higher BMI associated with poor SRH,[22,27] our data suggested that this association was mediated by CRF level. Therefore, our study indicates that an increased CRF level is of great value to public health because of its positive association with a better metabolic profile,[28] it might improve perceived health and as consequence psychological well-being[29] because SRH may extend beyond symptoms and be a somatic expression of life distress.[30]

This study has some limitations that need to be addressed. First the relative small sample and the cross-sectional design precludes conclusions on causality. Secondly sociodemographic variables were not used in the analysis despite they are a relevant predictor of lifestyle and health condition.[31] Therefore further assessment of socioeconomic status can give additional support for relationship between CRF, BMI, and perception of health. The self-rated health has some limitations as "state of health" but perceptions are also important with regard the health promotion campaigns. Further our study showed

a good reliability score, which gives additional strength to our data interpretation. Despite these limitations, this study provided an opportunity to extend research investigating the importance of CRF in adolescents' health. The data suggests a potential association between CRF and SRH, which, in turn, might suggest that a better CRF is associated with psychological well-being. Public health promotion activities aimed at children and adolescents should therefore be advocated, focusing more on the positive aspects of life and health. Further data are needed to replicate these findings using longitudinal designs.

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