Original Article

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Quick Response Code:

Website:
www.jehp.net

DOI:
10.4103/jehp.jehp_1024_22

Health-promoting domains and lifestyle of a sample of Brazilian adolescents

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Abstract:

BACKGROUND: Reports indicate that the health habits of adults are strongly linked to the behaviors incorporated in adolescence. Therefore, it is essential to monitor the lifestyle of adolescents to promote their present and future health. This study aimed to identify differences in health-promoting domains according to demographic data and lifestyle behaviors, including physical activity, sedentary behavior, sleep duration, and food intake, in a sample of Brazilian adolescents.

MATERIALS AND METHODS: Cross-sectional school-based study, with the participation of 306 adolescents aged 14 to 18 years. A questionnaire was applied with structured questions to collect demographic data and lifestyle behaviors. To examine the health-promoting domains the *Adolescent Health Promotion Scale (AHPS)* was used. Data were analyzed using multivariate analysis.

RESULTS: Scores attributed to each of the health-promoting domains showed substantial variations according to sex, age, year of study, parents' schooling, and family economic class. After adjustment for covariables, the adolescent who presented significantly higher scores equivalent to the overall index of health promotion reported being more physically active (F = 4.848; *P* = 0.009), sleeping 6–8 hours/night (F = 2.328; *P* = 0.046), consuming fruit/vegetable more frequently (F = 3.168; *P* = 0.024), while sedentary behavior and intake of sweetened products/soft drinks have not shown any significant effect.

CONCLUSION: The findings confirmed the consistent positive influence of health-promoting domains assessed by *AHPS* on healthy lifestyle behaviors, suggesting in the intervention programs aimed at adopting healthy lifestyle approaches it is important enough to contemplate actions aimed at all the areas of health promotion with characteristics aimed at nutrition behavior, social support, health responsibility, life appreciation, exercise behavior, and stress management.

Keywords:

Adolescent behavior, health behaviors, health habits, health-promoting behaviors, youths

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Received: 16-07-2022
Accepted: 10-10-2022
Published: 31-03-2023

Introduction

Healthy lifestyle promotion is recognized as an important determinant of health status. It is estimated that up to 60% of health-related quality of life depends on actions linked to health promotion and lifestyle behaviors.[1] In this context, healthy lifestyles depend fundamentally on the early adoption of healthy habits. More harmful habits adopted by adults are strongly linked to unhealthy behaviors from a young age.[2] Reports indicate that half of the preventable premature deaths may be associated with unhealthy habits incorporated in adolescence.[3]

Despite the difficulty of modifying unhealthy habits that adults adopt during adolescence, many harmful effects of risk behaviors identified at this age could be minimized or avoided if these behaviors were identified and modified at an early stage.[4] In general, it has been suggested that healthy behavior established in

How to cite this article: Guedes DP, Zuppa MA, Yamaji BH. Health-promoting domains and lifestyle of a sample of Brazilian adolescents. J Edu Health Promot 2023;12:83.

adolescence can help identify health status and the risks of presenting chronic non-communicable diseases later in life.[5] Therefore, it is essential to monitor the lifestyle components of adolescents to promote their present and future health.

Briefly, health promotion is understood as a process that allows individuals to protect their health; therefore, its main purpose is to prevent illness, improve quality of life and reduce possible costs for health services.[6] This definition should go beyond the focus on individual behavior and address a cluster of multidimensional factors, including social norms, cultural aspects, media, advertisements, public policies, and the environment, among others. Therefore, the adoption of healthy lifestyles should involve not only technical skills and theoretical knowledge about health promotion but also socio-emotional, cognitive-perceptual, and behavioral abilities so that these competencies can effectively be put into practice in the different contexts of real life.[7]

Adolescence is an important period of dynamic transition in which not only intense changes in body and mind conditions are identified, but especially in social relationships. In this period of development, the youth gradually acquires greater independence in his or her self-care actions and becomes more responsible for his or her health.[8] Thus, in theory, experimentation with new typical adolescent roles can increase the vulnerability and susceptibility of adolescents to harmful health conditions, and the main challenges include greater exposure to lifestyle risk behaviors.[9]

Thereby, the objective of this study was to identify differences in health-promoting domains according to demographic data and lifestyle behaviors, including physical activity, sedentary behavior, sleep duration, and food intake, in a sample of Brazilian adolescents. The hypothesis was immediately established in the sense that adolescents who report risk behaviors tend to present attitudes related to health promotion more affected than their peers with healthier lifestyle behaviors.

Materials and Methods

Study design and setting

This is an expert from the *Health Promoting School Project*, designed and implemented by the Federal Institute of Santa Catarina, São Miguel do Oeste Campus. It was chosen to involve adolescents enrolled only in this school unit, due to the longitudinal characteristics of the project (experimentation of health education programs), and their representativeness in the universe of high school students in the western region of the state of Santa Catarina, Brazil.

Study participants and sampling

The sample consisted of schoolchildren of both sexes, aged 14 to 18 years, who were attending high school. The student's participation in the study occurred due to a desire to participate in the experiment and with the parents' or guardians' authorization. To this end, all schoolchildren enrolled in the 2019 school year, together with their parents or guardians, were contacted and informed of the nature and objectives of the project, in addition to the principle of secrecy, not influencing school performance, and invited to participate in data collection. Refusal to participate in the study or not to attend the invitation after three contact attempts on different days and times were considered sample losses.

The criteria adopted for the exclusion of a student from the study were: (a) absence from classes on the scheduled day for data collection; (b) health problems that could temporarily or definitively prevent participation in the study; (c) use of some type of medicament that could induce changes in study variables; (d) being on some type of specific diet; (e) pregnancy; (f) inadequate filling of items in the measuring instrument (more than one answer for the same item or unanswered item); and (g) age less than 14 or more than 18 years. Thus, of the 418 schoolchildren enrolled in school, the definitive sample consisted of 306 adolescents (179 girls and 127 boys). The rights of all participants were safeguarded by the Free and Informed Consent Form signed by the students and their guardians.

Data collection tool and technique

Originally the project provided for the application of a self-report questionnaire consisting of three sections (demographic data, health-promoting domains, and lifestyle behaviors), the performance of anthropometric and blood pressure measurements, and the blood collection for cardiometabolic marker measurements. However, to meet the objective of the present study, only demographic data, health-promoting domains, and lifestyle behaviors were considered.

Data were collected between August and November 2019 by a team of researchers who knew the instrument and were trained in its procedures. The questionnaire was answered at a single moment individually by each of the participants and at their place and time of the class. The mean time to complete the questionnaire was 40 minutes. The questionnaire reliability was analyzed by reapplying it to 10% of the subjects seven days later. All the items presented *a Cohen* concordance index ≤ 0.80

For demographic data, in addition to sex and age, information was collected on the year of study, parents' schooling, and family economic class, based on housing conditions, household utensils, cars, and the number of

domestic employees, according to Brazil's classification criteria, recommended by the Brazilian Association of Research Companies guidelines.[10]

To examine the health-promoting domains, the *Adolescent Health Promotion Scale* (*AHPS*), translated, adapted, and validated for use in the young Brazilian population was used.[11] *AHPS* is based on the Pender Health Promotion Model[12] and was originally designed to identify dimension and order six domains associated with health promotion specifically for adolescents: (a) nutrition behavior; (b) social support; (c) health responsibility; (d) life appreciation; (e) exercise behavior; and (f) stress management.[13] The translated version *of AHPS* consists of 34 items in which the respondent indicates the degree that most applies to his or her case utilizing a five-point Likert scale (1= "*Never*"; 2= "*Rarely*"; 3= "*Sometimes*"; 4= "*Usually*"; 5= "*Always*"). In this case, higher scores reflect more positive health-promoting domains. The scores of each of the six domains are obtained by calculating the average scores assigned to the items on the scale, while the overall index of health promotion is obtained by calculating the mean scores assigned to the 34 items.

Information equivalent to lifestyle behaviors was obtained through items equivalent to physical activity, sedentary behavior, sleep duration, and food intake. The physical activity was identified by the formulation of the question: "*In the last seven days, how often have you performed moderate to vigorous physical activity for at least 60 minutes (consider any type of physical activity* that has increased your heart and respiratory rate, *such as walking quickly, running, pedaling, swimming, or other similar activities; and the total time, that is, it doesn't need to been 60 minutes followed, can add up the moments of the day you performed some kind of physical activity)?* The answer options for the question were from "*none*" to "*seven days*." From the frequency reported by the adolescents, three groups were stratified for analysis: (a) ≤2 days/week; (b) 3–6 days/week; and (c) 7 days/week.

Sedentary behavior was treated by exposure to recreational screen time through the question: *In a typical or usual week, how many hours do you watch TV and/or use a computer, tablet, or smartphone for any activity that is not related to any kind of assignment or homework?* A predefined time scale was provided for response, in which the respondents indicated their option between six categories, ranging from "*none*" to "≤5 *hours/day*". The question considered separately the use of screen devices equivalent to weekdays and weekends (Saturday and Sunday). Weighted average involving the days of week and weekends data was used to identify the screen time per day. In this case, the three strata identified were: (a) ≤2 hours/day; (b) 3–4 hours/day; and (c) ≥5 hours/day.

Data equivalent to sleep duration were also gathered considering days of week and weekends, about a typical or usual week, using the following questions: *On weekdays and weekends (Saturday and Sunday): (a) at what time do you usually sleep? (b) and at what time do you wake up?* In possession of the reports presented by the participants, sleep time was calculated on weekdays and weekends. Weighted average involving the days of the week and weekends data was used to identify the duration of sleeping time per night. To analyze, sleep duration per night was stratified into three strata: (a) <6 hours/night; (b) 6–8 hours/night; and (c) >8 hours/night.

Regarding food intake, the participants have positioned how often they consume fruit/vegetable and sweetened products/soft drinks through the following questions: (A) "*In the last seven days, how often have you eaten fruits and/or vegetables (don›t consider fruit juices)?*"; and (b) "*In the last seven days, how often have you* drunk a bottle, can, or cup of soda and/or eaten cake, pie, cookies, sweets, or similar? The answer options for both questions were from "*none*" to "*seven days*." *Intake* frequencies were grouped into (a) intake ≤2 days/week; (b) intake 3–6 days/week; and (c) intake 7 days/week.

Data analysis

Data analysis was conducted using the *IBM® SPSS® Statistics for Windows Package*, version 27 (IBM Corporate, Armonk, New York, USA). The sample demographic characterization was performed using the relative frequency of data. Regarding the scores for the six domains and the overall index of health promotion, the frequency distribution was initially analyzed using *the Kolmogorov-Smirnov test*. Considering that they showed a normal frequency distribution, the parametric statistics resources were used, through mean and standard deviation calculation. Subsequently, to establish comparisons among the demographic data, the univariate variance analysis was used, accompanied by the *Scheffe* multiple comparison tests to identify specific differences. Regarding lifestyle behaviors, point proportions and respective confidence intervals ($CI_{95\%}$) were identified and stratified according to sex and age. Statistical differences among strata under investigation were analyzed using contingency tables and Chi-square non-parametric test (χ^2). Comparisons among the scores equivalent to the health-promoting domains of the adolescents categorized in the strata of each lifestyle approach were performed using analysis of covariance (ANCOVA), adjusted by sex, age, year of study, parents' schooling, and family economic class, accompanied by *the Scheffe* multiple comparison tests to identify specific differences. A *P*-value lower than 0.05 was considered a statistically significant level in all the tests.

Ethical consideration

The intervention protocols were approved by the Research Ethics Committee of Western Santa Catarina University (Platform Brazil – no. 3.412.665/2019).

Results

The study participants had an average age equivalent to 16.34 ± 1.21 years. The demographic data of the selected sample are available in Table 1.

Table 2 shows data from the descriptive statistics of the health-promoting domains. The mean score of the overall index of health promotion was 3.35 ± 0.50, with lower scores attributed to the *health responsibility* domain (2.85 ± 0.76) and higher to the *life appreciation* domain (3.72 ± 0.68). However, comparisons among mean values identified in the demographic data strata show that the scores assigned to each health-promoting domain disguise substantial variations. The girls presented significantly higher scores in the *social support* domains, *health responsibility*, *life appreciation,* and *stress management*, while the boys scored higher scores in the *exercise behavior* domain. Regarding age, younger adolescents scored higher scores in the domains *of nutrition behavior*, *exercise behavior,* and *stress management*. As for the year of study, the adolescents who studied in the first years of high school also presented statistically higher scores in the domains of *nutrition*, *exercise,* and *stress management*. Parents' schooling significantly influenced adolescents to score in the domains of *nutrition behavior*, *social support*, *responsibility for health*, *life appreciation,* and *stress management*. Regarding family economic class, adolescents from families with higher purchasing power presented statistically higher scores in the domains of *nutrition behavior* and *life appreciation*, whereas adolescents with lower purchasing power scored higher scores in the domain of *exercise behavior*.

Table 1: Demographic data of the selected sample in the study (*n*=306)

	n (%)		*n* (%)
Sex		Parents' schooling	
Girls	179 (58.5%)	≤5 years	62 (20.3%)
Boys	127 (41.5%)	6-11 years	129 (42.2%)
Age		≥12 years	115 (37.5%)
14-15 years	80 (26.1%)	Family economic class	
16-18 years	226 (73.9%)	Low	37 (12.1%)
Year of Study		Intermediate	209 (68.3%)
1st Year	117 (38.2%)	High	60 (19.6%)
2nd Year	106 (34.6%)		
3rd Year	83 (27.2%)		

Table 3 shows the exposure of adolescents to lifestyle behaviors according to sex. Both sexes reported similar behaviors regarding sedentary behavior and sleep duration. However, significantly higher proportions of boys were shown to be more physically active (7 days/week), while young girls showed more favorable food

Table 2: Health-promoting domains of the adolescents according to demographic data

	Nutrition Behavior	Social Support	Health Responsibility	Life Appreciation	Exercise Behavior	Stress Management	Overall Index
Sex	*F*=0.535; *P*=0.593	*F*=3.611; *P*=0.001	*F*=3.081; *P*=0.005	*F*=2.034; *P*=0.043	*F*=3.845; *P*<0.001	*F*=2.130; *P*=0.035	*F*=0.422; *P*=0.673
Girls	3.57±0.64 [a]	3.56±0.66	2.95±0.75	3.65±0.67	3.04±0.89	3.32±0.65	3.34±0.53 [a]
Boys	3.53±0.67 [a]	3.31±0.67	2.71±0.74	3.81±0.69	3.43±0.87	3.09±0.80	3.36±0.45 [a]
Age	*F*=2.309; *P*=0.025	*F*=0.554; *P*=0.457	*F*=0.278; *P*=0.598	*F*=0.076; *P*=0.784	*F*=2.342; *P*=0.023	*F*=2.715; *P*=0.014	*F*=2.092; *P*=0.045
14-15 years	3.73±0.59	3.39±0.70 [a]	2.79±0.73 [a]	3.70±0.72 [a]	3.34±0.89	3.38±0.71	3.46±0.50
16-18 years	3.51±0.67	3.48±0.67 [a]	2.87±0.76 [a]	3.72±0.66 [a]	3.15±0.90	3.12±0.75	3.31±0.49
Year of Study	*F*=2.504; *P*=0.031	*F*=0.518; *P*=0.396	*F*=0.311; *P*=0.507	*F*=0.092; *P*=0.694	*F*=3.902; *P*=0.001	*F*=4.846; *P*<0.001	*F*=1.982; *P*=0.047
1st Year	3.62±0.66 [a]	3.42±0.58 [a]	2.81±0.74 [a]	3.69±0.67 [a]	3.36±0.69	3.41±0.78	3.39±0.47 [a]
2nd Year	3.58±0.64 [a,b]	3.46±0.62 [a]	2.86±0.77 [a]	3.73±0.72 [a]	3.17±0.77	3.15±0.69	3.33±0.51 [a,b]
3rd Year	3.44±0.61 [b]	3.51±0.65 [a]	2.89±0.72 [a]	3.71±0.69 [a]	3.01±0.82	2.93±0.64	3.21±0.58 [b]
Parents' Schooling	*F*=3.546; *P*=0.005	*F*=2.419; *P*=0.035	*F*=2.959; *P*=0.029	*F*=5.873; *P*<0.001	*F*=1.672; *P*=0.066	*F*=2.515; *P*=0.032	*F*=3.106; *P*=0.026
≤5 years	3.32±0.67	3.35±0.66 [a]	2.69±0.68 [a]	3.28±0.69	3.11±0.85 [a]	3.01±0.59 [a]	3.13±0.56
6-11 years	3.60±0.62 [a]	3.43±0.62 [a,b]	2.84±0.73 [a,b]	3.88±0.67 [a]	3.17±0.72 [a]	3.21±0.64 [a,b]	3.35±0.53 [a]
≥12 years	3.64±0.65 [a]	3.55±0.69 [b]	2.92±0.74 [b]	3.75±0.63 [a]	3.28±0.80 [a]	3.26±0.74 [b]	3.41±0.55 [a]
Family economic class	*F*=3.974; *P*=0.019	*F*=1.168; *P*=0.096	*F*=1.657; *P*=0.193	*F*=2.655; *P*=0.042	*F*=3.796; *P*=0.024	*F*=2.585; *P*=0.047	*F*=3.464; *P*=0.033
Low	3.39±0.61 [a]	3.31±0.67 [a]	2.99±0.81 [a]	3.65±0.69 [a]	3.47±0.87	3.13±0.68 [a]	3.30±0.49 [a]
Intermediate	3.57±0.66 [a,b]	3.45±0.64 [a]	2.77±0.73 [a]	3.76±0.68 [a,b]	3.16±0.83 [a]	3.25±0.83 [a,b]	3.36±0.48 [a,b]
High	3.63±0.65 [b]	3.50±0.68 [a]	2.95±0.81 [a]	3.88±0.61 [b]	3.01±0.75 [a]	3.38±0.84 [b]	3.49±0.51 [b]

[a,b]Equal letters indicate statistical similarities

Table 3: Exposure to lifestyle behaviors according to the sex of adolescent

	Both sex	Girls	Boys	*P**
Physical activity				
≤2 days/week	34.3 (30.5-38.6)	40.2 (34.2-46.2)	26.0 (23.4-29.1)	<0.001
3-6 days/week	44.5 (37.8-51.1)	44.2 (37.6-50.8)	45.7 (38.8-52.5)	ns
7 days/week	21.2 (19.1-23.7)	15.6 (14.4-17.2)	28.3 (25.1-31.9)	<0.001
Sedentary behavior				
≤2 hours/day	30.4 (27.1-34.4)	29.1 (25.9-32.9)	32.3 (28.7-36.5)	ns
3-4 hours/day	47.4 (40.3-54.5)	46.9 (39.9-53.9)	48.0 (40.8-55.2)	ns
≥4 hours/day	22.2 (20.0-24.9)	24.0 (21.6-26.9)	19.7 (17.7-21.8)	ns
Sleep duration				
<6 hours/night	21.3 (19.2-23.9)	23.5 (21.2-26.3)	18.1 (16.3-20.3)	ns
6-8 hours/night	44.4 (37.7-51.1)	43.5 (36.9-50.0)	45.7 (38.8-52.5)	ns
>8 hours/night	34.3 (30.5-38.8)	33.0 (29.4-37.2)	36.2 (31.5-40.9)	ns
Fruit/Vegetable intake				
≤2 days/week	29.1 (26.2-32.3)	28.5 (25.7-32.2)	29.9 (26.6-33.8)	ns
3-6 days/week	41.2 (35.4-47.0)	38.0 (33.1-43.3)	45.7 (38.8-52.6)	0.032
7 days/week	29.7 (26.7-33.0)	33.5 (29.8-37.5)	24.4 (22.0-27.3)	0.007
Sweetened products/soft drinks intake				
≤2 days/week	14.1 (13.2-15.3)	14.5 (13.3-16.0)	13.4 (12.6-14.6)	ns
3-6 days/week	50.6 (43.0-58.2)	55.9 (47.5-64.2)	43.3 (36.8-49.8)	0.001
7 days/week	35.3 (31.4-39.8)	29.6 (26.3-33.4)	43.3 (36.8-49.8)	<0.001

*Comparison between both sex by Chi-square test (χ^2)

intake, pointing to higher daily fruit/vegetable intake and lower daily intake of sweetened products/soft drinks.

Results of the analysis of covariance by statistical adjustment by sex, age, year of study, parents' schooling, and family economic class, comparing scores attributed to health-promoting domains according to patterns of lifestyle behaviors are available in Table 4. An adolescent who reported being more active physically presented scores regarding the *overall index* and the domains of *social support*, *life appreciation*, *exercise behavior*, and *stress management* were significantly higher. Sleep duration also showed significant effects on the scores attributed to the domains of *life appreciation* and *stress management*, in addition to the *overall index of health promotion*. Also, adolescents who reported consuming fruit/vegetable more frequently presented scores equivalent to the domains of *nutrition behavior*, *health responsibility*, *life appreciation*, *stress management*, and *overall index* significantly higher. Adolescents who have assumed more frequent intake of sweetened products/soft drinks have had a significant effect only in the domain of *nutrition behavior-related health promotion*, while in the case of screen-based sedentary time no significant effect was identified on *overall index* and assigned individually to each health-promoting domain.

Discussion

The study aimed to analyze possible differences in scores attributed to health-promoting domains according to demographic data and lifestyle behaviors in a representative sample of Brazilian adolescents. To our knowledge, the potentiality of the study is the possibility of considering health-promoting domains for the first time in the literature through an internationally accepted instrument (*AHPS*) together with selected lifestyle behaviors. The findings of the study corroborate future interventions, considering that it adds to the subjective health-promoting domains of traditional lifestyle behaviors, including physical activity, sedentary behavior, sleep duration, and food intake, which effectively influence the health status of youths.[14]

In general, *AHPS* was designed to identify and dimension the perception of adolescents in different health-promoting domains. The domain related to *nutrition behavior* aims to identify the perception of healthy eating habits, the domain *social support* regarding the skills equivalent to the social competencies, the domain related to *health responsibility* linked to the perception of the commitment to care for the health itself, the domain *life appreciation* to the positive perspectives on the present and future goals and expectations, the domain *exercise behavior* to the predisposition to physical effort practice and the domain *stress management* to the personal practices that help reduce daily tensions. In addition, the scores allocated to all six domains that make up *AHPS* allow the analysis of health promotion using an overall index.[13]

Regarding the perception registered by the adolescents in the study, in principle, considering that the mean score of the overall index and none of the domains separately approached the possible extreme scores (1 or 5), in a certain

Table 4: Values of mean, standard deviation and statistics "F" equivalent to scores computed by adolescent for health-promoting domains according to selected lifestyle behaviors

	Nutrition Behavior	Social Support	Health Responsibility	Life Appreciation	Exercise Behavior	Stress Management	Overall Index
Physical Activity	F=0.929; P=0.119	F=2.270; P=0.048	F=1.651; P=0.057	F=5.775; P<0.001	F=9.105; P<0.001	F=5.882; P<0.001	F=4.848; P=0.009
≤2 days/week	3.52±0.68[a]	3.37±0.68[a]	2.78±0.74[a]	3.45±0.63	2.50±0.78	2.96±0.67	3.12±0.54
3-6 days/week	3.56±0.65[a]	3.47±0.74[a,b]	2.86±0.78[a]	3.79±0.69	3.48±0.82	3.22±0.69	3.41±0.53
7 days/week	3.61±0.62[a]	3.59±0.72 [b]	2.94±0.72[a]	4.01±0.76	3.74±0.75	3.53±0.74	3.59±0.49
Sedentary Behavior	F=0.144; P=0.723	F=1.341; P=0.078	F=1.032; P=0.107	F=1.875; P=0.051	F=1.734; P=0.052	F=1.683; P=0.056	F=1.512; P=0.060
≤2 hours/day	3.54±0.66[a]	3.54±0.67[a]	2.91±0.68[a]	3.84±0.64[a]	3.32±0.81[a]	3.29±0.68[a]	3.44±0.49[a]
3-4 hours/day	3.59±0.64[a]	3.45±0.65[a]	2.83±0.74[a]	3.66±0.69[a]	3.14±0.87[a]	3.15±0.74[a]	3.32±0.51[a]
≥4 hours/day	3.52±0.69[a]	3.41±0.68[a]	2.81±0.75[a]	3.68±0.67[a]	3.15±0.84[a]	3.12±0.72[a]	3.28±0.53[a]
Sleep Duration	F=1.296; P=0.081	F=1.763; P=0.054	F=0.723; P=0.144	F=4.231; P=0.018	F=1.446; P=0.069	F=5.985; P<0.001	F=2.328; P=0.046
<6 hours/night	3.47±0.64[a]	3.54±0.65[a]	2.80±0.69[a]	3.48±0.62[a]	3.15±0.74[a]	2.76±0.77	3.20±0.57[a]
6-8 hours/night	3.55±0.67[a]	3.49±0.62[a]	2.86±0.71[a]	3.89±0.64	3.27±0.71[a]	3.34±0.69[a]	3.42±0.49 [b]
>8 hours/night	3.63±0.69[a]	3.37±0.51[a]	2.87±0.76[a]	3.64±0.71[a]	3.13±0.79[a]	3.29±0.72[a]	3.34±0.55[a,b]
Fruit/Vegetable Intake	F=5.912; P<0.001	F=1.628; P=0.053	F=2.889; P=0.031	F=4.953; P=0.004	F=1.135; P=0.099	F=2.579; P=0.041	F=3.168; P=0.024
≤2 days/week	3.17±0.64	3.36±0.62[a]	2.71±0.69[a]	3.44±0.61	3.15±0.84[a]	3.06±0.61[a]	3.17±0.56
3-6 days/week	3.69±0.72[a]	3.52±0.67[a]	2.86±0.76[a,b]	3.77±0.72[a]	3.19±0.79[a]	3.22±0.64[a,b]	3.38±0.58[a]
7 days/week	3.74±0.60[a]	3.47±0.56[a]	2.99±0.64[b]	3.92±0.68[a]	3.26±0.75[a]	3.31±0.69 [b]	3.45±0.51[a]
Sweetened products/soft drinks intake	F=5.469; P=0.001	F=1.539; P=0.059	F=1.185; P=0.072	F=1.548; P=0.061	F=1.238; P=0.086	F=0.918; P=0.121	F=1.893; P=0.053
≤2 days/week	3.81±0.67[a]	3.53±0.63[a]	2.93±0.78[a]	3.82±0.67[a]	3.26±0.81[a]	3.28±0.83[a]	3.44±0.54[a]
3-6 days/week	3.69±0.63[a]	3.49±0.64[a]	2.87±0.76[a]	3.73±0.64[a]	3.22±0.84[a]	3.20±0.79[a]	3.38±0.49[a]
7 days/week	3.28±0.62	3.39±0.61[a]	2.79±0.81[a]	3.67±0.65[a]	3.14±0.79[a]	3.19±0.87[a]	3.26±0.52[a]

Analysis of covariance by means of adjustment by sex, age, year of study, parents' schooling, and family economic class. [a,b]Equal letters indicate statistical similarities

way the results suggest a report of health-promoting practices in a moderate dimension. However, significant differences were identified among the scores attributed by adolescents of both sexes in specific health-promoting domains, which demonstrates the need for distinct interventions for each sex. The girls presented more favorable scores in the domains *of social support*, *health responsibility*, *life appreciation,* and *stress management*, while the boys showed greater adherence to the *exercise behavior* domain. These results show similarities with those found in other studies,[6-16] although conflicting with those found in Chinese[13] and Turkish adolescents.[17] These controversies can probably be attributed to the contextual effects inherent in the cultural aspects of such countries.

The evidence available in the literature suggests that girls may be more sensitive to interpersonal relationships and more emotionally oriented than boys,[18] which can help to be more attentive to health-promoting domains associated with psycho-socio-affective factors and health care. In addition, parents' closer monitoring concerning the girls' actions at this age can be a protective factor for health-promoting domains. On the other hand, despite the reasons that try to explain the differences between both sexes in the predisposition to practice physical activity result from the combination of biological and sociocultural factors,[19] the possible influence of physical education teaching programs that still prevails in schools in Latin American countries should be highlighted, which are designed for sports activities aimed at meeting with great emphasis the expectations and interests of boys; however, at the same time, tending to disconnect girls of more physically active habits.

Regarding the age and year of studies of participants, younger adolescents who studied in less advanced years of schooling scored higher scores on the overall index of health promotion and specific domains related to *nutrition behavior*, *exercise behavior,* and *stress management*, which coincides with the results presented by other studies.[13-17] These findings may be related to the fact that younger adolescents have more parental care and control, while older adolescents have greater autonomy and parents become more tolerant of their health behaviors. Still, in Brazil, adolescents who study in the last years of schooling tend to be more intensely involved in the preparation of the admission exam for university courses and, therefore, are less concerned about health-promoting domains. Thus, these results highlight the risk of older adolescents studying in the last years of basic education and moving to adulthood with more compromised health-promoting domains that can reverberate into future health problems.

There was also a significant effect of parents' schooling on the overall index and most health-promoting domains. Previous studies agree that children of parents with higher schooling tend to present more consolidated health promotion indicators than children of parents with less schooling.[16,17,20] In fact, parents with higher schooling have the opportunity to appropriate health knowledge and to assume healthier attitudes, thus allowing them to pass on their cultural capital and serve as a model that encourages their children to have more appropriate perceptions of health promotion.

Another demographic data that influenced health promotion domains was the economic class of the adolescent family. Adolescents from families with higher purchasing power presented higher scores in the overall index and the domains of *nutrition behavior* and *life appreciation*, and adolescents with lower economic class scored higher in the *exercise behavior* domain. These findings are consistent with the results of some studies[21]; however, it confronts with results of others,[6,17] demonstrating that the influence of the family economic class on the perception of adolescents' health promotion is not consensual. The main reason for this divergence may be linked to the method used to identify the strata of family economic class. In the literature, some studies aimed to identify the family economic class through income regardless of the formation of its nucleus, the occupational activity of each member, or possession of household utensils and goods.

Upon analyzing the data on lifestyle behaviors, it was observed that, in general, no more than one in each group of five adolescents (21.1%) met the public health guidelines for recommended levels of physical activity (300 minutes/week),[22] with the tendency to decline with age and boys as being more frequent in their practice than girls. As regards comparisons between the current findings and surveys previously carried out in Brazil and other countries, an important difficulty to be considered refers to the differences in the methodological designs used, as a rule, by selecting samples not representative of the population segment under consideration and use of measurement procedures, defining physical activity domains and different cutoff points. However, an international study that gathered around 1.6 million participants aged 11 to 17 years from surveys in 146 countries showed a global trend of insufficient physical activity close to 81%. In the same study, the specific prevalence among Brazilian adolescents was equivalent to 83.6%.[23]

Sedentary behavior was treated by leisure screen time, equivalent to the time spent watching television or using a computer, *tablet,* or *smartphone*. The combination of several other sedentary daily activities, such as sitting in the classroom, reading, listening to music, talking to friends, etc., may eventually be considered more

appropriate for the analysis of a sedentary lifestyle. However, it was chosen to use leisure screen time considering the trend of greater variation among youths and more effective voluntary control.[24] In this particular, guidelines proposed by public health agencies around the world recommend that school-age youths accumulate ≤2 hours/day of leisure screen time.[25] In this case, the proportion of adolescents in the study who met the current screen time guideline was low (≈30%); however, it does not seem to be different from that observed in other national[26] and international[14] surveys.

Another worrying fact identified in the study was the high proportion of adolescents who showed sleep duration ≤8 hours/night (65.7%). More recently, sleep in the young population has been intensively investigated due to the implications for mental health and metabolic settings at this age.[27] On the other hand, similar to what was observed in previous surveys carried out in Brazil[28] and other countries,[29] the daily intake of fruit/vegetables reported by the adolescents in the study was less frequent (29.5%). Regarding the sweetened products/soft drinks intake, corroborating findings available in young populations from other countries,[30] the data found suggest that more than ⅓ of adolescents reported consuming sweetened products/soft drinks daily.

According to the hypothesis previously proposed for the study, the results showed that after control of potential confounding variables (demographic data), those adolescents who reported healthy lifestyle behaviors tended to indicate significantly higher scores in health-promoting domains. Thus, the findings confirmed the important positive influence that health-promoting domains identified and dimensioned by *AHPS* can exert on lifestyle behaviors.

An adolescent who reported being more physically active and consuming more fruit/vegetable, compared to their peers fewer active and with less frequent intake habits of this food group, presented higher scores in most domains, including the overall index of health promotion. Lifestyle behaviors associated with sleep duration and sweetened products/soft drinks intake have had effects in specific domains; however, when comparing scores attributed to the health promotion scale according to screen-based sedentary time, no significant differences were identified in any of the domains.

The lack of data available in the literature on the influence of health-promoting domains on lifestyle behaviors prevents establishing a parallel between these findings and results from previous studies. However, the Pender Model of health promotion assumes that the individual determinants with the greatest impact on health promotion perception are lifestyle-related health behaviors,[12] which to some extent corroborates our findings. In addition, until then, one of the weaknesses attributed to the use of *AHPS* refers to the absence of indicators on its concurrent validity.[11] Consequently, the results found in this study reinforce the promising aspect of the use of this scale in interventions to perform diagnoses and follow actions directed to the development of health-promoting domains in the Brazilian school context.

The study is not free from potential limitations. The investigation method used to identify the multiple behaviors of the lifestyle involved a self-report questionnaire, thus allowing possible memory bias or even biased statements in the direction of the desirable, although an accurate data quality control procedure was implemented to minimize possible inaccuracies. The sample selected is representative of the population of high school adolescents in the western region of Santa Catarina State, Brazil. For this reason, although careful delimitation, definition, and selection of the sample were used, the results should not be generalized to populations of adolescents from different sociocultural environments and economic development. Additional studies should be conducted to generalize the findings with greater safety.

Furthermore, the cross-sectional nature of the data may limit the inferences of the long-term effects of the health-promoting domains on lifestyle behaviors, due to the outcome and independent variables being identified at the same time, increasing the risk of inverse causality bias. In this case, longitudinal data are necessary to establish trajectories of variations associated with health-promoting domains and their influence on changes in lifestyle behaviors, which are already being considered. Also, residual confusion caused by unidentified and unmeasured factors may in some way enhance the possible inaccuracy of the findings. Another important aspect to be observed, especially as the study deals with the expanded concept of health promotion, is the fact that lifestyle behavior with an addictive dimension, including tobacco use, alcohol consumption, and other drugs, was not included.

Conclusion

The main conclusions of the study revealed that boys, older adolescents, who studied in the last years of high school, in which parents had a lower level of schooling and belonged to a less privileged family economic class, reported attitudes more committed to health promotion, constituting therefore in the groups most vulnerable to present and future health problems. Also, the consistent positive influence of health-promoting domains

identified and dimensioned by *AHPS* on healthy lifestyle behaviors was confirmed, with emphasis on physical activity and food habits, suggesting, therefore, that, if health-promotion attitudes are a priority among the most physically active adolescent students who consume fruit/vegetable more frequently, in intervention programs aimed at adopting healthy lifestyle approaches, it is important enough to contemplate actions aimed at all health-promoting domains with characteristics intended for *nutrition behavior*, *social support*, health *responsibility*, *life appreciation*, *exercise behavior*, and *stress management*.

The findings made available in this study should add new evidence to the scarce body of knowledge about the interaction of health-promoting domains-lifestyle behaviors and provide relevant subsidies for future actions, considering that studies with this theme involving Brazilian adolescents and from other regions of the world are rare. Finally, as most healthy and unhealthy lifestyle behaviors are incorporated in adolescence with repercussions for life, health education programs designed and implemented with effective health promotion strategies are crucial for schooling youths.

Acknowledgements

The authors would like to thank all the students who volunteered to participate in the study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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