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original article

Changes in lifestyle and self-rated health among high school students: A prospective analysis of the "Saúde na Boa" project

Mudanças no estilo de vida e na percepção da saúde em estudantes do ensino médio: análise prospectiva do projeto "Saúde na Boa"

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Abstract – Lifestyle characteristics can modify the self-rated health of young people, but additional prospective evidence is needed. This study examined the association between changes in lifestyle and self-rated health among students. A secondary analysis of the "Saúde na Boa" project was performed, considering data from 984 students (14-24 years old, 56.9% girls) who were randomly selected from 20 public schools in Recife and Florianopolis, Brazil. Two sets of data 9-months apart were collected, and self-reported data about lifestyle characteristics (physical activity practices, TV watching time, dietary habits, alcohol and tobacco consumption, and sleep time) and self-rated health (poor, fair, good, very good and excellent) were obtained. Differences in self-rated health between collections were categorized as negative changes, stable (no changes) or positive changes. Adjusted multinomial logistic regression analysis was used ($p < 0.05$). After adjustment for confounding variables, increasing the weekly frequency of active commuting to school (adjusted odds ratio [aOR] = 2.06) and intake of fruits/fruit juice (aOR = 1.81), as well as reducing the monthly frequency of alcohol consumption (aOR = 2.17), was significantly associated with positive changes in self-rated health. Consumption of sweets was also associated with stable self-rated health. In conclusion, our prospective evidence demonstrated that changes in lifestyle characteristics appear to be essential to ensure or generate positive self-rated health in youth.

Key words: Eating habits; Health status; Motor activity; Prospective studies; Young.

Resumo – *O estilo de vida pode modificar a percepção da saúde em jovens, porém evidências prospectivas são necessárias. Este estudo analisou a associação entre mudanças no estilo de vida e na percepção da saúde em estudantes. Análise secundária do projeto "Saúde na Boa", com uma amostra de 984 estudantes (14 a 24 anos, 56,9% de meninas), selecionados aleatoriamente, em 20 escolas públicas de Recife e Florianópolis, Brasil. Duas coletas foram realizadas com nove meses de diferença para obter "self-reported" dados do estilo de vida (prática de atividade física, tempo de TV, hábitos alimentares, consumo de álcool e tabaco, e duração do sono) e da percepção da saúde (ruim, regular, boa, muito boa e excelente). A percepção da saúde foi categorizada em três níveis, considerando as alterações entre os intervalos das coletas: mudou negativamente, manteve ou mudou positivamente. A regressão logística multinominal ajustada foi utilizada, com $p<0.05$. Após ajuste para variáveis de confusão, aumentar a frequência semanal de deslocamento ativo para escola (odds ratio ajustado [ORa] = 2.06) e de consumo de frutas/suco de frutas (ORa = 1.81), bem como reduzir a frequência mensal de consumo de álcool (ORa = 2.17) estiveram significativamente associados à alterações positivas na percepção da saúde após os nove meses de acompanhamento. O consumo de doces também mostrou associação com a manutenção na percepção da saúde. Em conclusão, evidências prospectivas demonstraram que mudanças do estilo de vida em diferentes componentes parecem ser fundamentais para garantir ou gerar uma percepção positiva da saúde na juventude.*

Palavras-chave: *Atividade motora; Estado de saúde; Estudos prospectivos; Jovem; Hábitos alimentares.*

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INTRODUCTION

A relatively old concept from the World Health Organization (1946) emphasizes that health is "not merely the absence of disease but a state of complete physical, mental and social well-being"[1]. Based on this definition, psychological measures such as self-rated health (i.e., self-assessment about a person's own conditions and his/her current health status) have become objects of epidemiological studies as important as the identification of physiological diseases[2,3]. There is evidence indicating that self-rated health in youth[4] and adulthood[5,6] is inversely associated with morbidity and mortality. Thus, building positive self-ratings of health in earlier years can be an important step for assuring the present and future health status of a population.

By contrast, approximately 15% of the youth population of European countries report negative self-rated health[2]. In the United States, the estimate is approximately 10%[7], which is similar to the rate observed in Brazilian adolescents[8]. There was a trend towards stabilization of self-rated health in the European youth population from 2006 to 2010[2], but an increase occurred among the North American young[7]. Brazil, a middle-income country, experienced a slight increase in the proportion of young people with negative self-rated health from 2003 to 2008 (from 9.3% to 10.0%)[8]. Therefore, studying health perceptions and their potential determinants is crucial to help plan and target interventions for the modifiable factors that are associated with self-rated health in youth[3,9].

Lifestyle factors, such as physical activity[9-16], watching TV[11], eating habits[10,16], substance abuse (e.g., alcohol and tobacco)[10,13,17] and sleep time[11], have been associated with self-rated health among young people. However, most of this evidence has been obtained in cross-sectional studies, and they are limited in their ability to explore causal relationships between two variables. Limited longitudinal evidence has focused on the relationship between lifestyle and other psychological components (e.g., mental well-being and depression)[18-21] or has assessed only self-rated health in adulthood[12,15]. Therefore, a study evaluating prospective changes in lifestyle factors and their role in self-rated health among young people is needed for targeting interventions to promote health and well-being in young populations.

Thus, the present study prospectively examined the association between changes in lifestyle factors (physical activity, watching TV, eating habits, alcohol and tobacco consumption and sleep time) and self-rated health in a sample of Brazilian adolescents.

METHODOLOGICAL PROCEDURES

This study was a secondary and prospective analysis of data from a randomized-controlled intervention entitled the "Saúde na Boa" project[22]. The purpose of this intervention was to promote healthy behaviors (primarily physical activity and healthy eating) among high school students who stud-

ied at night in public schools from two Brazilian cities: Florianopolis (Santa Catarina), southern Brazil, and Recife (Pernambuco), northeastern Brazil.

Approximately two thousand youths were evaluated in March 2006 (aged 14-24 years) from 20 randomly selected schools (10 in each city, with 5 schools for the experimental group and 5 for the control group). The selection was stratified by school size (small 200 students or less, medium 200-499 students, and large 500 students or more) and geographical location. Nine months after baseline (December 2006), a new data collection wave was performed, with response rates of 45.9% (989 students assessed at follow-up). Detailed information about the characteristics of the cities involved, the target population and the sample selection procedure were described in a previous publication[22]. Additionally, the dropout sample's demographic, socioeconomic and behavioral characteristics have been analyzed in another manuscript in this supplement[23]. For the present study, we considered students that had valid data for self-rated health, totaling a sample of 984 high school students. It was possible to detect a statistically significant odds ratio > 1.34 for watching TV (factor with higher exposure to positive change) and an odds ratio > 1.63 for tobacco consumption (factor with lower exposure to positive change). For other lifestyle factors, the sample size could detect statistical significance for an odds ratio in this range. The prevalence of outcomes (positive change in self-rated health) in unexposed groups was 25.2% and 24.4% for watching TV and tobacco consumption, respectively. A confidence interval (CI) of 95% and a power of 80% was fixed in this estimate.

In March and December 2006, students answered the questionnaire the "Saúde na Boa" project, which was previously validated[24]. The questionnaire included close answer items on physical activity practices, eating habits and other lifestyle factors (e.g., alcohol and tobacco consumption and sleep duration) based on the PACE+ questionnaire (Patient-Centered Assessment and Counseling for Exercise Plus Nutrition)[24]. The questionnaire also included sections for personal and sociodemographic information, sedentary behaviors, body weight control and preventive behaviors.

The instrument was applied in the classroom following previous instructions. The application of standardized collection protocols in both cities was conducted by a properly trained team consisting of students and teachers of Physical Education and Nutrition.

Students answered the following question, "Overall, how would you rate your health?" Each student reported their health on a Likert scale with five points ("poor," "fair," "good," "very good" or "excellent"). The difference in responses between baseline and 9-month follow-up collection allowed for the generation of a score categorized as one of three levels: 1) negative change (e.g., from good to fair), 2) stable (not modified), or 3) positive change (e.g., from very good to excellent).

Ten lifestyle factors were considered in this study. In the physical activity section, the weekly frequency (days/week) of days in which the students performed at least 60 minutes of physical activity was obtained.

The weekly frequency (days/week) of active commuting (walking/biking) to school and exercise for muscular strength/endurance was also evaluated. We evaluated the daily duration of TV viewing (hours/day) as a sedentary behavior factor. In the eating habits section, we considered the weekly frequency (days/week) of the consumption of fruits/fruit juice and sweet/soft drinks. We also investigated the monthly frequency (days/month) of tobacco and alcohol consumption and the daily sleep duration (hours/day). For each lifestyle component, we calculated the difference in responses between baseline and 9-month follow-up. The scores were grouped into three categories: decreased, stable or increased. We ordered the categories from the worst to the most favorable scenario for a healthy lifestyle outcome.

Demographic and socioeconomic variables were included as potential confounds: gender (boys and girls), age group (14-16 years, 17-19 years and 20-24 years), skin color (white and non-white), marital status (single or otherwise), occupation (work, volunteer or not working), residence with family (yes or no) and type of property (house, apartment/other). Nutritional status at follow-up was determined by calculating body mass index (body weight [kg]/height^2 [m^2]) and its classification according to gender and age[25].

Absolute and relative frequencies (with 95% CI) were used to describe the control variables, the lifestyle components, and self-rated health. We also showed the proportion of students in each lifestyle category and self-rated health change group. Multinomial logistic regression was used to calculate odds ratios for prospective changes in lifestyle and changes in self-rated health among students. A negative change in self-rated health was considered to be the outcome reference. For the exposure variables, the categories that represented the worst lifestyle changes (e.g., decrease in the frequency of weekly physical activity) were considered to be the exposure reference. Gender was not associated with changes in self-rated health and did not moderate the results when we performed these analyses using the entire sample. All analyses were adjusted for potential confounds (gender, age group, skin color, marital status, occupation, type of property, residence with family, nutritional status, situation in the intervention, city and self-rated health and lifestyle factor at baseline). All analyses were performed with Stata v. 11 (Stata Corp., College Station, TX, USA) considering a significance level of $p < .05$.

All procedures were approved by the Ethics Committee of the Federal University of Santa Catarina (031/2005) and the *Instituto Materno Infantil de Pernambuco* (587/2005). The negative consent term ("passive parental consent form") of the parents or guardians of students under 18 years was obtained, as well as from students with 18 or more years.

RESULTS

The study sample was composed of students from Florianopolis (53.3%) and Recife (46.6%). For the "Saúde na Boa" project, 52.0% of students were from

intervention schools and 48.0% were from control schools. The majority of the sample was female, aged 17-19 years, non-white, single, unemployed, living with his/her family and living in houses. Two out of ten students were overweight (Table 1).

Table 1. Baseline characteristics from the sample with valid data. (n=984).

Variables†	n	% (95% CI)
City (n=984)		
Florianopolis, SC	525	53.3 (50.2; 56.5)
Recife, PE	459	46.6 (43.5; 49.8)
Project condition (n=984)		
Intervention	512	52.0 (48.9; 55.2)
Control	472	48.0 (44.8; 51.1)
Gender (n=984)		
Boys	397	40.4 (37.3; 43.5)
Girls	585	59.6 (56.5; 62.7)
Age groups (n=984)		
14-16 years	313	31.8 (28.9; 34.7)
17-19 years	411	41.8 (38.7; 44.8)
20-24 years	260	26.4; 23.7; 29.2)
Skin color (n=981)		
White	434	44.2 (41.1; 47.3)
Non-white	547	55.8 (52.6; 58.9)
Marital status (n=983)		
Singe	814	82.8 (80.4; 85.2)
Married/others	169	17.2 (14.8; 19.5)
Ocupation status (n=977)		
Did not word	429	43.9 (40.8; 47.0)
Volunteer	374	38.3 (35.2; 41.3)
Paid work	174	17.8 (15.4; 20.2)
Lived with the family (n=977)		
Yes	852	87.2 (85.1; 89.3)
No	125	12.8 (10.7; 14.9)
Property of the family (n=979)		
House	860	87.8 (85.8; 89.9)
Apartament/others	119	12.2 (10.1; 14.2)
Nutritional status (n=959)		
Overweight	770	80.3 (77.8; 82.8)
Normal weight	189	19.7 (17.2; 22.2)

† Sample values in parentheses indicate the valid data for the respective variable.
95% CI = 95% confidence interval

There was overlap in the 95% CI between baseline and 9-month follow-up in the prevalence of students in each category of self-rated health (poor, fair, good, very good, excellent). However, approximately half of the students had changes in self-rated health after 9 months. One in four students showed a positive change (e.g., from good to very good), while 23.3% of students showed a negative change in self-rated health (Figure 1).

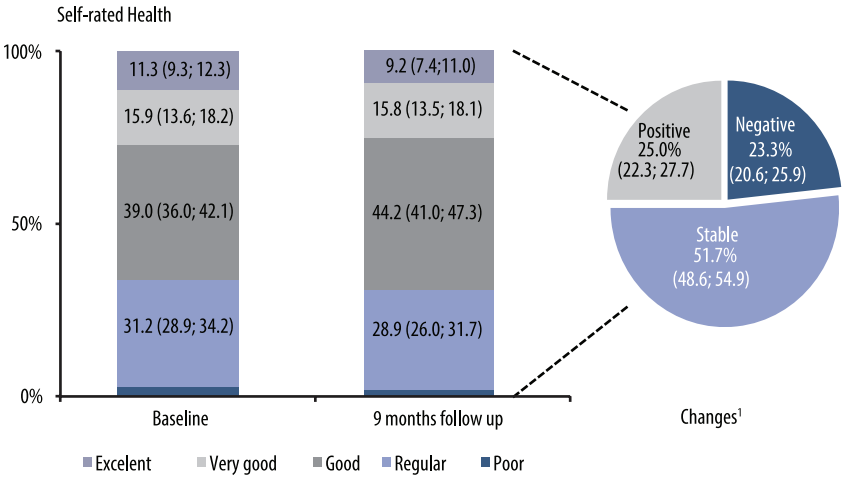

Figure 1. Prevalence (95% confidence interval) of self-rated health at baseline, 9-months follow-up and changes between the two assessments among high school students. (n = 984).
† Differences between baseline and 9-months follow-up were classified as negative change (e.g., from good to fair), stable or positive change (e.g., from very good to excellent).

Table 2. Prevalence and 95% confidence interval of the lifestyle variables among high school students at baseline and 9-months follow-up. (n = 984).

Lifestyle factors†	Baseline		9 months follow-up	
	%	95% CI	%	95% CI
Physical activity during 60 minutes (n=965)				
≥ 5 days/week	44.6	41.5; 47.7	32.8	29.8; 35.7
< 5 days/week	55.4	52.3; 58.5	67.2	64.3; 70.2
Active commuting to school (n=945)				
≥ 1 day/week	83.4	81.0; 85.8	83.9	81.6; 86.3
No days	16.6	14.2; 18.9	16.0	13.7; 18.4
Muscular strength/endurance exercise (n=955)				
≥ 1 day/week	35.4	32.4; 38.4	42.9	39.8; 46.0
No days	64.6	61.5; 67.6	57.1	54.0; 60.2
TV watching time (n=972)				
< 2 hours/day	37.0	34.0; 40.0	41.3	38.2; 44.4
≥ 2 hours/day	63.0	60.0; 66.0	58.7	55.6; 61.8
Fruits/fruit juice consumption (n=968)				
≥ 5 days/week	45.5	42.4; 48.6	40.1	37.0; 43.2
< 5 days/week	54.5	51.4; 57.6	59.9	56.8; 63.0
Sweets consumption (n=966)				
< 5 days/week	68.7	65.7; 71.6	76.1	73.4; 78.9
≥ 5 days/week	31.3	28.3; 34.2	23.8	21.1; 26.6
Soda consumption (n=965)				
< 5 days/week	65.4	62.4; 68.4	70.5	67.6; 73.3
≥ 5 days/week	34.5	31.6; 37.5	29.5	26.6; 32.4
Tobacco consumption (n=959)				
No days	86.5	84.3; 88.6	85.9	83.7; 88.1
≥ 1 day/month	13.5	11.4; 15.7	14.1	11.9; 16.3
Alcohol consumption (n=730)				
No days	50.4	47.2; 53.6	52.4	49.3; 55.6
≥ 1 day/month	49.6	46.4; 52.7	47.5	44.4; 50.7
Sleep time (n=769)				
≥ 8 hours/day	87.4	85.0; 89.7	91.0	89.2; 92.8
< 8 hours/day	12.6	10.2; 15.0	9.0	7.2; 10.8

† Values in parentheses indicate valid data for the respective lifestyle variable.
95% CI = 95% confidence interval.

Table 3. Prevalence and odds ratio of the association between changes in lifestyle and self-rated health among high school students. (n = 984).

Lifestyle factors	n	Self-rated health (reference: negative change) ††			
		Stable		Positive change	
		%	aOR† (95% CI)	%	aOR† (95%CI)
Physical activity during 60min. (days/week)					
Decrased	439	52.4	1.00	24.1	1.00
Stable	222	52.7	1.07 (0.68; 1.67)	24.3	1.06 (0.62; 1.39)
Increased	304	49.7	1.07 (0.67; 1.69)	27.0	1.39 (0.79; 2.43)
Active commuting to school (days/week)					
Decrased	316	50.0	1.00	21.5	1.00
Stable	326	54.9	1.68 (1.10; 2.58)	25.8	1.93 (1.47; 3.27)
Increased	303	49.5	1.46 (0.92; 2.31)	28.7	2.06 (1.19; 3.59)
Strength/endurance exercise (days/week)					
Decrased	451	55.0	1.00	24.6	1.00
Stable	265	50.9	1.09 (0.65; 1.82)	25.7	1.29 (0.71; 2.36)
Increased	239	47.7	1.09 (0.49; 2.39)	23.8	1.79 (0.67; 4.78)
TV watching time (hours/day)					
Increased	280	51.8	1.00	24.6	1.00
Stable	296	51.3	1.05 (0.66; 1.65)	25.7	1.31 (0.75; 2.27)
Decreased	396	51.7	1.14 (0.71; 1.83)	24.7	1.22 (0.69; 2.16)
Fruits/fruit juice consumption (days/week)					
Decrased	373	48.8	1.00	24.7	1.00
Stable	274	50.7	1.11 (0.74; 1.68)	23.3	1.18 (0.65; 1.80)
Increased	321	55.4	1.68 (1.04; 2.72)	27.4	1.81 (1.02; 2.50)
Sweets consumption (days/week)					
Increased	309	47.6	1.00	27.5	1.00
Stable	251	56.2	1.62 (1.02; 2.58)	22.7	1.08 (0.61; 1.88)
Decreased	406	51.5	1.34 (0.85; 2.11)	24.9	0.99 (0.57; 1.71)
Soda consumption (days/week)					
Increased	303	50.5	1.00	25.1	1.00
Stable	270	54.4	1.22 (0.78; 1.92)	24.4	1.03 (0.59; 1.77)
Decreased	392	50.5	1.02 (0.66; 1.56)	25.8	0.93 (0.55; 1.57)
Tobacco consumption (days/month)					
Increased	79	44.3	1.00	27.8	1.00
Stable	802	52.4	1.61 (0.86; 3.02)	24.1	1.05 (0.51; 2.18)
Decreased	78	56.4	2.37 (0.83; 6.75)	28.2	2.55 (0.74; 8.77)
Alcohol consumption (days/month)					
Increased	224	48.7	1.00	23.7	1.00
Stable	489	23.3	1.53 (1.00; 2.34)	23.3	1.30 (0.77; 2.19)
Decreased	243	48.1	1.31 (0.75; 2.56)	29.6	2.17 (1.11; 4.23)
Sleep time (hours/day)					
Decrased	236	49.6	1.00	26.7	1.00
Stable	316	52.5	0.88 (0.56; 1.40)	21.5	0.60 (0.34; 1.06)
Increased	178	53.4	1.49 (0.4; 2.64)	28.1	1.43 (0.73; 2.80)

† Adjustment for gender, age, skin color, marital status, occupation, type of property, lived with family, nutritional status, project condition (intervention or control), city, self-rated health and behavior at baseline. †† Differences between baseline and 9-months follow-up in self-rated health were classified as negative change (e.g., from good to fair), stable or positive change (e.g., from very good to excellent). aOR (95% CI) = adjusted *odds ratio* (95% confidence interval).

Considering the prevalence of lifestyle factors at baseline and at 9-month follow-up, there was overlap in the 95% CI window for most of the measured lifestyle factors. The exceptions were the weekly frequency of physical activity (decreased) and exercise for muscular strength/endurance (increased, Table 2).

After adjustment for potential confounds, students who maintained their weekly frequency of active commuting to school and sweets consumption had higher odds ratios for maintaining their self-rated health (reference: negative change in self-rated health) compared to peers who reduced their weekly frequency of these behaviors. Additionally, a higher odds ratio for maintaining their self-rated health was observed among students who increased their weekly frequency of fruits/fruit juice consumption (Table 3).

Considering the odds ratio for a positive change in self-rated health (reference: negative change in self-rated health), we observed that both maintaining and increasing their weekly frequency of active commuting to school was significantly associated with positive changes in students' self-rated health. Additionally, increasing their weekly frequency of fruits/fruit juice consumption and reducing their monthly frequency of alcohol consumption were also significantly associated with greater odds ratios for having positive changes in self-rated health. Changes in other behaviors (total physical activity, TV watching time, sweets, soft drinks and tobacco consumption, and sleep duration) were not significantly associated with a maintenance or positive change in self-rated health at 9-month follow-up (Table 3).

DISCUSSION

To our knowledge, this is the first study to examine whether prospective lifestyle changes are associated with changes in self-rated health among young students. Two extant investigations that examined the prospective association between physical activity and self-rated health measured outcomes only in adulthood[12,15]. Other studies have examined the prospective association between lifestyle factors and psychological components in young people, but they did not evaluate self-rated health[18-21]. Our results demonstrated that changes in some lifestyle factors (active commuting to school, eating habits and alcohol consumption) were statistically associated with positive changes in self-rated health in young people. These associations remained significant even after adjustment for potential confounding factors, such as gender, age, nutritional status, socioeconomic status and self-rated health at baseline. This evidence reinforces the importance of promoting healthy lifestyles, as well as how these changes may provide improvements in the perceived health of youth.

Maintaining or increasing the weekly frequency of active commuting to school was associated with positive changes in self-rated health among students. There is no previous data indicating an association between these

variables. Only two prospective studies have indicated that the weekly frequency of physical activity in adolescence[12] and changes during adolescence in this variable (i.e., becoming active)[15] are positively associated with self-rated health in adulthood. However, these studies assessed physical activity during leisure time, and the extrapolation of these findings to other domains of physical activity (in this case, the transport domain) is infeasible. Active commuting to school has decreased among youth over the years, and intervention actions have had modest effects in promoting active commuting in these populations[26]. A recent systematic review[27] indicated that active commuting to school could bring health benefits, such as reducing obesity, but prospective evidence for other health outcomes are needed. Our findings suggest that incentives to promote active commuting may be essential not only to increase total physical activity time and to promote active lifestyle physiological benefits but also to promote a positive perception of health status among young people.

There was not a significant prospective association between the weekly frequency of physical activity for at least 60 minutes daily or the weekly frequency of muscular strength/endurance exercises and self-rated health. These results differ from studies with cross-sectional designs[9-11,13,14,16]. However, we performed our assessment of physical activity subjectively. While subjective and objective (e.g., accelerometry or pedometrics) measures can differentiate in the association with health outcomes[28], we highlight the need for future studies evaluating whether objectively measured physical activity and other measures of physical activity are prospectively associated with self-rated health among young people.

Changing specific eating habits (i.e., the weekly frequency of consumption of sweets and fruits/fruit juice) was significantly associated with changes in self-rated health. Cross-sectional data also highlighted the importance of a healthier diet on health perceptions among the young[10,16], but prospective data are unexplored. One study evaluated whether diet quality was prospectively associated (at one year follow-up) with mental health (assessed with the Pediatric Quality of Life Inventory) among Australian students[20]. This study showed that improvements in diet quality were inversely associated with depressive symptoms. Intervention studies are also needed to test the effectiveness for the prevention of psychological problems (such as the negative self-rated health) through dietary modification.

Additionally, the high consumption of sweets and the low consumption of fruit are alarming among the Brazilian youth population[29]. Thus, changing these eating habits seems to be crucial for promoting positive self-rated health. Special attention may be given to creating environments that promote healthy eating and to the creation of strategies that involve parents and the school community in the adoption or maintenance of good nutrition during adolescence.

Decreasing the monthly frequency of alcohol consumption was highly statistically associated with positive changes in self-rated health (see Table 3). Cross-sectional data have showed a similar trend[10]. A review of reviews

on the effects of alcohol consumption on youth health[30] indicated that alcohol consumption might be associated with feelings of depression, anxiety, and suicide attempts among youth. However, many studies show fragility analysis of temporal or causal relationships between the variables, resulting in conclusions that are often ambiguous (i.e., alcohol consumption stemming from psychological problems vs. the reverse)[30]. Although a possible bidirectional effect is plausible, this study provided important information that, independent of self-rated health and alcohol consumption at baseline, the reduction of alcohol consumption was associated with positive changes in the self-rated health. This evidence supports the idea that public interventions aimed at reducing alcohol consumption are key to promoting mental health and perceived health among young people.

Changes in TV viewing time, sleep duration and tobacco consumption were not associated with changes in self-rated health (see Table 3). Although some cross-sectional studies have not corroborated our findings[11,13,17], prospective evidence is lacking. However, it seems acceptable to hypothesize that monitoring short (only 9 months) and subjective measures of behavior may explain, in part, this lack of association between variables. The low prevalence of students who reported tobacco consumption and the difficulties of reducing the consumption of this substance may also explain the lack of association between self-rated health and this variable (see Table 3). Future investigations with a prospective design and longer follow-up duration are encouraged. Additionally, studies with objective measures, especially for sleep duration and other sedentary behaviors, may help to determine whether these lifestyle factors are determinants of self-rated health in youth.

The prospective design is one of the strengths of our study because it allowed us to analyze changes in lifestyle and their associations with self-rated health. Furthermore, the inclusion of different lifestyle factors allowed us to indicate how changes in perceived health in youth are predicted by a set of behavioral factors that together represent the lifestyle, as opposed to a single factor. Another strength of the study was the inclusion of a sample of students residing in cities in two Brazilian regions with distinct sociocultural profiles (Northeast and Southeast). This design aspect increases the degree of extrapolation of data. Finally, the assessment of lifestyle and self-rated health is for a young population from a middle-income country, and much of the literature on this subject has been derived from high-income countries[9,19].

Considering possible limitations, we highlight the subjectivity of our measures of lifestyle factors, which, at times, may explain the lack of association with self-rated health. However, the context for certain lifestyle factors, such as active commuting to school and watching TV, are difficult to measure objectively in studies with large samples. Another limitation was the 9-month follow-up period, which may have been relatively short for finding associations between some variables. Finally, a dropout of over 50% was also a limitation. These comments do not diminish the importance of the findings, but they do encourage continued discussion when searching

for consistent and prospective evidence about lifestyle characteristics in youth and their impact on mental health in early and future ages.

CONCLUSIONS

Changes in lifestyle factors, such as increasing the weekly frequency of active commuting to school and the rate of fruits/fruit juice consumption, as well as reducing sweet and alcohol consumption, were important determinants of self-rated health among students. This association remained significant even after adjustment for potential confounding factors, including self-rated health and lifestyle factors at baseline. These results suggest that multiple lifestyle factors, not a single specific factor, are determinants of changes in perceived health among young people. Creating environments that encourage the shifting to active, healthy eating habits and the reduction of alcohol consumption are keys to ensuring positive perceptions of health in youth. These interventions, with an associated modification of lifestyle factors, deserve special attention for their ability to promote mental health in young people.

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