

## Self-perceived social relationships are related to health risk behaviors and mental health in adolescents

A percepção dos relacionamentos sociais está relacionada à comportamentos de risco associados à saúde e à saúde mental em adolescentes

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**Abstract** *Although changes have been observed in social relationships in the recent years, especially among younger generations, little evidence is available concerning factors associated with adolescents' perceived social relationships. In this study we investigated the association between self-perceived social relationships, health-related behaviors, biological maturation, and mental health in adolescents. This is a cross-sectional study conducted with 1,336 adolescents (605 boys and 731 girls) aged between 10 to 17 years from public schools. Self-perceived social relationships (family, friends, and teachers), feelings of stress and sadness, academic performance, tobacco smoking, alcohol and fat consumption, physical activity, and screen time were evaluated by a questionnaire. Biological maturation was assessed by the peak height velocity. We observed that worse perceived social relationships were associated with tobacco smoking (family and teachers), alcohol drinking (teachers), higher consumption of fat (teachers), greater feelings of stress (family and teachers) and sadness (family and friends), and poor academic achievement (friends and teachers).*

**Key words** *Mental disorders, Social support, Healthy lifestyle, Academic performance*

**Resumo** *Apesar das mudanças observadas nos relacionamentos sociais nos últimos anos, especialmente entre as gerações mais novas, pouca evidência está disponível sobre os fatores associados à percepção dos relacionamentos sociais. Neste estudo nós investigamos a associação entre a percepção das próprias relações sociais, comportamentos associados à saúde, maturação biológica e indicadores de saúde mental em adolescentes. Este é um estudo transversal conduzido com 1.336 adolescentes (605 meninos e 731 meninas) com idades entre 10 e 17 anos, alunos de escolas públicas. A percepção dos relacionamentos sociais (família, amigo e professores), frequência de sentimentos de estresse e tristeza, o desempenho acadêmico, consumo de álcool, tabaco e alimentos gordurosos, bem como o nível de atividade física e tempo de tela foram avaliados por questionário. A maturação biológica foi estimada a partir do pico de velocidade de crescimento. Observamos que as piores relações sociais percebidas estiveram relacionadas ao consumo de tabaco (família e professores), de álcool (professores), alto consumo de alimentos gordurosos (professores), sentimentos de estresse (família e professores) e de tristeza (família e amigos) mais frequentes, e pior percepção do desempenho acadêmico (amigos e professores).*

**Palavras-chave** *Transtornos mentais, Apoio social, Estilo de vida saudável, Desempenho acadêmico*

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## Introduction

Humans tend to construct relationships with their peers, developing in this way, a desire to belong<sup>1</sup>. When positive and significant social relationships are established, subjects tend to present greater cognitive and mental health<sup>2</sup>. However, in situations where social relationships are violated or pass through turbulent moments, individuals can perceive feelings such as loneliness and social isolation, which are negative for mental health and well-being, causing various diseases and disturbances<sup>2</sup>.

Since Durkheim<sup>3</sup> found that suicide rates are greater among single subjects (when compared with married persons), several investigations have presented possible paths of influence of social relationships and health, such as a meta-analysis developed in 2010 that concluded that individuals with good social relationships had a 50% greater propensity for survival compared to people with poor social relationships<sup>4</sup>. In this way, good social relationships seem to be protective factors for several negative health and psychological outcomes, such as depression and anxiety<sup>5-7</sup> and even all-cause mortality<sup>4,8-10</sup>. Moreover, good social networks are related to greater healthy behaviors such as physical activity and low sedentary behavior<sup>11</sup>, which in turn seem also to be related to psychological health<sup>12,13</sup>.

Several pathways can connect poor perceived social relationships with negative health outcomes, given that a potential psychological mechanism may be through the adoption of healthier behaviors among persons inserted in good social relationships, which could lead to lower risk and greater well-being, when compared to their socially socially isolated individuals<sup>4,8,9</sup>. Another mediator could be through negative feelings caused by social isolation such as sadness, stress, and loneliness<sup>14</sup>. Consequently, in both direct and indirect ways, bad social relationships are related to health risks<sup>4,8</sup>. However, the correlates of social relationships from early ages in different cultural contexts are unclear. Herein, we investigated the association between self-perceived social relationships, health-related behaviors, biological maturation, and mental health adolescents.

## Methods

This is a cross-sectional epidemiological school-based study in Brazilian adolescents aged between 10 and 17 years, enrolled in public schools

of Londrina-PR. Londrina has 506,701 inhabitants, a medium human development index of 0.778, and a gross domestic product per capita of US\$ 8,530.77 (both above the average of Brazilian cities)<sup>15</sup>. All the procedures used in the study were approved by the Research Ethics Committee of the Londrina State University, according to the Declaration of Helsinki.

Sample recruitment was performed in two stages. First, all public schools of the city were separated into regions (north, south, east, west, and center) and two schools were randomly selected from each location. Subsequently, classes of these schools were randomly selected and all students within the classes (except those using prescription medicine or undergoing treatment for an illness) were invited to participate in the study. Students who failed to return a consent form signed by parents were ineligible. Recruitment peaked at 1,395 adolescents but 59 failed to provide all required data for the analysis of this study and were excluded. Thus, the final sample was composed of 1,336 adolescents (605 boys and 731 girls).

### Perception of social relationships

Self-perception about relationships with friends, families, and teachers was assessed through a questionnaire. Specifically, the questionnaire contained questions with a Likert type scale (from 1 to 4; “very unsatisfied” to “very satisfied”) and asked: “Regarding your relationship with your classmates and friends, are you?”; “Regarding your relationship with your family, are you?”; and “Regarding your relationship with your teachers, are you?”. The reproducibility of the measures was tested through repeated application (7-day interval) of the questions in 74 adolescents, which were not included in the current sample. The intraclass correlation coefficient (ICC) was calculated. For perception of social relationships, the ICCs of the questions were 0.50 (friends), 0.53 (family), and 0.69 (teachers). We classified as poor social relationships those who answered “unsatisfied and very unsatisfied” in each domain.

### Sadness and stress

Sadness was also collected through a Likert type scale question: “How often you feel sad or depressed?”, options ranged from “very frequently” to “rarely” (four possibilities) with an ICC of 0.62. Likewise, stress was evaluated through

a scale type question: “How often you feel stressed?”, options ranged from “very frequently” to “rarely” with an ICC of 0.80. We considered as stressed and sad, those who answered “very frequently” and “frequently” for each question.

#### **Academic performance**

To access academic performance, the participants were asked: “How do you classify your academic performance?”. Answer options ranged from “Bad” to “Great” (four possibilities) with an ICC of 0.81. We considered as low academic performance those who answered “Bad”.

#### **Alcohol and tobacco consumption**

Information on alcohol consumption and tobacco smoking was obtained in a dichotomous manner through indication of use during the previous 30 days. The ICCs for alcohol consumption and tobacco smoking were 0.74 and 0.78 respectively.

#### **Fat consumption**

The consumption of fatty food was evaluated by means of one question (ICC=0.76) concerning the frequency of consumption (no consumption, one to three days, four to six days, and seven days) during the previous week. The cutoff used for inadequate dietary pattern was the consumption of these foods on four or more days per week.

#### **Physical activity and screen time**

The Baecke questionnaire<sup>16</sup> was applied and the score proposed by the authors adopted as an indicator of physical activity (ICC=0.73). The Baecke questionnaire was not designed to propose prevalence, thus, the sample was divided into quartiles and adolescents in the highest quartile of the sample distribution were considered “active”. The screen time (ICC=0.77) in minutes per week and at the weekend was adopted as an indicator of sedentary behavior. Similar to physical activity, adolescents in the lowest quartile of screen time were considered as not sedentary.

#### **Socio-economic status**

Socio-economic status was estimated through the ABEP questionnaire<sup>17</sup>, which con-

siders the education of the household leader and certain possessions, providing a score based on this information. From the information reported by the parents, it was possible to categorize the participants into classes (A1, A2, B1, B2, C, D, and E). Classification in classes C, D, and E was considered as low socioeconomic status.

#### **Biological maturation**

Biological maturation was estimated through somatic maturation derived from estimated age at peak height velocity using the algorithm proposed by Mirwald et al.<sup>18</sup>. This method estimates distance in years from peak height velocity through anthropometric variables (stature, sitting height, leg length, and body mass). The prediction of age at peak height velocity is determined by subtracting the maturity-offset from chronological age.

#### **Statistical procedures**

Values of means and standard deviations, as well as frequencies and confidence intervals are used to characterize the sample. The Mann-Whitney’s test was used to compare general characteristics between sexes. The chi-square and chi-square for trend were used to test associations between social relationships and potential correlates. For the main analyses, binary and multinomial logistic regressions with odds ratio and 95% confidence interval were used. All analyzes were performed in software SPSS 23.0.

### **Results**

In total, 1,395 adolescents were evaluated. However, due to missing data, 59 adolescents were excluded from the initial sample. Thus, the final sample was composed by 1,336 adolescents. Table 1 presents the general characteristics of the sample.

Table 2 presents the correlates of poor social relationships (with family, friends, and teachers). While girls were less satisfied with their relationships with friends, older adolescents showed poorer relationships with family and teachers. Early maturers presented more positive perceptions of relationships with friends and teachers. In the adjusted models ( $p < 0.05$ ), a lower prevalence of satisfaction with friends was observed among those who reported less screen time. Smokers and alcohol drinkers showed a poor-

**Table 1.** General characteristics of sample.

	Boys	Girls
Chronological age, y	13.01±1.51	12.82±1.43
Body mass, kg	48.8±14.0	47.7±11.7
Stature, cm	156.3±11.8	154.3±11.7
Age of PHV, y	14.3±0.7*	12.3±0.7
Body mass index, kg/m <sup>2</sup>	19.72±3.94	19.94±4.07
Bad relationship		
With family	10.2% (8.1 to 12.9)	13.0% (10.8 to 15.7)
With friends	8.1% (6.2 to 10.6)	11.5% (9.4 to 14.0)
With teachers	37.9% (34.1 to 41.8)	37.2% (33.8 to 40.8)

Note: Data is described in means with standard deviation and frequencies with confidence intervals of 95%. \* $p < 0.05$  between sexes. PHV=peak height velocity.

Source: Elaborated by the authors.

er perception of relationships with family and teachers. In addition, poor perception of social relationships was associated with inadequate fat consumption (teachers), bad school performance (friends and teachers), and a high prevalence of feelings of sadness (family and friends) and stress (family and teachers).

The association between exposures and clusters of bad social relationships are presented in Figure 1. After the adjustment for all variables of the model, we found that while the highest fat consumers (OR (CI95%)=1.56 (1.19 to 2.03)) and those delayed in maturation (OR (CI95%)=1.98 (1.21 to 3.25)) were more likely to report dissatisfaction with at least one social relationship, adolescents with the worst academic performance (OR (CI95%)=3.82 (2.51 to 5.82)), tobacco smokers (OR (CI95%)=3.45 (1.74 to 6.84)), the saddest (OR (CI95%)=2.53 (1.64 to 3.90)), and the most stressed (OR (CI95%)=2.37 (1.52 to 3.70)) were more likely to report dissatisfaction with more than one social relationship.

## Discussion

Our aim was to verify the association between self-perceived social relationships and health-related behaviors, biological maturation, and mental health in adolescents. We found that adolescents who presented bad perceptions of social relationships demonstrated a greater prevalence of unhealthy habits (tobacco smoking, alcohol drinking, and higher fat consumption), worse perceived academic performance, and greater feelings of sadness and stress. Being inserted in good social relationships seems to protect against

several negative health outcomes. Studies have shown associations between social inclusion/support and all-cause mortality<sup>10,19,20</sup>. Thus, our finding shows potential behavioral, biological, and physiological pathways that could link social relationships and negative outcomes among adolescents.

We observed that adolescents who smoked tobacco and related using alcohol were more likely to report bad perceptions of social relationships with family and teachers. Instead, adolescents who are inserted in good social relationships tend not to present these negative habits. It was demonstrated that adolescents who present unhealthy and alternative behaviors tend to be discriminated against and could develop poor social perception<sup>21,22</sup>. This is probably related to the specific laws in each country. In Brazil, for example, alcohol consumption and tobacco smoking are prohibited for individuals under 18 years-old, which might explain the dissatisfaction with social actors who flout this. In this sense, given that adolescents tend to create relationships with subjects with similar lifestyles and habits<sup>23</sup>, no association with these unhealthy behaviors and perceived relationships with friends was observed.

We also found that adolescents who reported higher fat consumption were more likely to present at least one poor social relationship, especially with teachers. A previous study reported that adolescents with high consumption of fast-foods presented a lower perception of general quality of life<sup>24</sup>, and food practices are related to social relationships<sup>25</sup>. On the one hand meals with family tend to be healthier and could explain an association with satisfaction with family; however,

**Table 2.** Prevalence of perceived social relationship with family, friends and family according to categories of the correlates.

	Family	OR <sub>adj</sub> (CI95%)	Friends	OR <sub>adj</sub> (CI95%)	Teachers	OR <sub>adj</sub> (CI95%)
Sex						
Boys	10.2%		8.1%	1	37.9%	
Girls	13.0%		11.5%	1.54 (1.03 to 2.29)	37.2%	
Age						
10-12	8.0%	1	9.1%		30.6%	
13-14	13.6%	1.53 (1.04 to 2.25)	13.1%		43.8%	
15-16	21.9%	2.41 (1.44 to 4.04)	9.7%		44.8%	
Somatic maturity						
Late	14.9%		14.4%		46.1%	
On time	10.6%		9.4%		37.7%	
Early	10.7%		6.8%		27.4%	
Socioeconomic Status						
Highest	10.2%		9.1%		37.2%	
Lowest	10.8%		10.2%		36.2%	
Physical activity						
Inactive	11.5%		10.2%		35.2%	
Active	11.5%		8.3%		43.9%	
Screen time						
Low	13.2%		12.8%	1	34.1%	
High	10.5%		8.4%	0.60 (0.41 to 0.87)	39.3%	
Tobacco Smoking						
No	10.4%	1	9.6%		35.4%	1
Yes	27.0%	2.28 (1.40 to 3.72)	14.4%		61.3%	1.78 (1.14 to 2.78)
Alcohol drinking						
No	10.3%		10.1%		34.2%	1
Yes	18.3%		9.4%		52.2%	1.43 (1.04 to 1.96)
Fat consumption						
Adequate	11.3%		10.8%		33.4%	1
Inadequate	13.0%		8.7%		45.4%	1.50 (1.18 to 1.92)
Scholar performance						
Good	9.6%		7.9%	1	28.6%	1
Bad	16.7%		14.6%	2.08 (1.42 to 3.04)	58.0%	2.90 (2.26 to 3.74)
Sadness						
Low	7.1%	1	8.2%	1	33.7%	
High	20.5%	2.55 (1.75 to 3.71)	13.3%	1.60 (1.09 to 2.34)	44.3%	
Stress						
Low	7.0%	1	7.9%		30.0%	1
High	18.1%	1.85 (1.26 to 2.72)	12.4%		47.3%	1.76 (1.39 to 2.24)

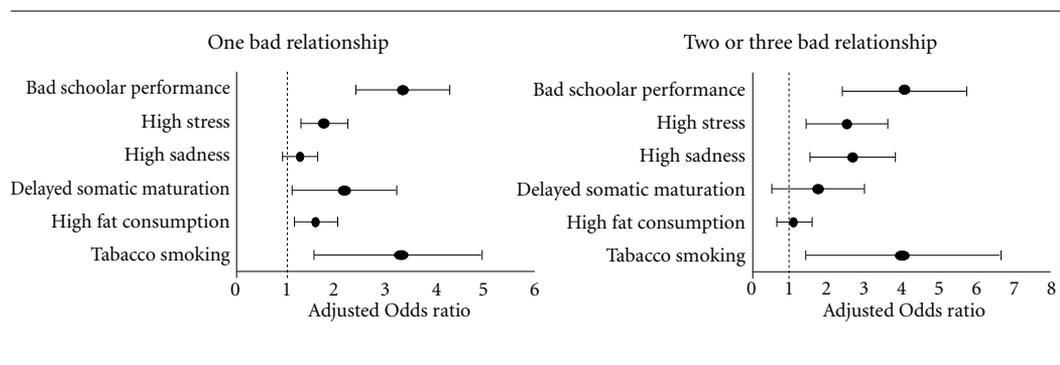
Note. The emboldened values indicated  $p < 0.05$ . Adjusted odds ratio (OR<sub>adj</sub>) values are show for variables included in the final model only.

Source: Elaborated by the authors.

the relation between fat consumption and satisfaction with teachers is curious and unclear. It is probably this relates to the link between health behaviors and academic performance, however further studies are needed.

Another interesting finding concerned screen time. Even though sedentary behavior is positive-

ly associated with cardiovascular risk factors<sup>26</sup>, we found that adolescents with higher screen time were less likely to present a bad perception of relationships with friends. A possible explanation for this finding is the association between some types of screen time (e.g., videogames and online games) and socialization among adolescents<sup>11,27</sup>.



**Figure 1.** Correlates of at least one and more than one bad perceived social relationship in adolescents. Note: Analyses are adjusted by sex.

Source: Elaborated by the authors.

Considering a biological correlate, we found that early maturing adolescents were more satisfied with their friends and teachers. This bio-social relationship has been poorly studied, but it is supposed that adolescents who are advanced in the biological process (e.g., height, body mass, muscular strength)<sup>28</sup> have greater social acceptability and social networks<sup>29</sup>. The early development of secondary sexual characteristics could also be related with greater success among peers<sup>30,31</sup>.

Perceived social relationships were also related to mental health indicators. Adolescents who reported a greater frequency of feelings of sadness were more likely to be dissatisfied with their relationships with family and friends. Moreover, those with higher stress were less satisfied with their relationships with family and teachers. The explanation for these findings could be two-fold although we cannot confirm this in a cross-sectional designed study. People might develop a worse mental health condition since they are not satisfied with their social cycle or, in another path, people with poor mental health tend to perceive or create worse social relationships. This situation could be more drastic in adolescence, considering this is a period with great changes in school, romantic relationships, biological maturation, and responsibilities, among others<sup>32,33</sup>. Thus, given the high prevalence of mental disorders and their relationship with perceived social relationships, surveillance and promotion of social support during this phase should be mandatory<sup>34</sup>.

Based on our findings, adding that unhealthy habits are correlated, multi-behavioral strategies

aiming to decrease alcohol consumption, tobacco smoking, fat consumption, and other negative behaviors should be adopted. Previous studies showed that simple counseling could provide positive results for reducing alcohol consumption and unhealthy dietary patterns<sup>35,36</sup>. However, broader and multilevel interventions need to be conducted in school-based environments<sup>37</sup>.

This study has limitations that should be pointed out. Firstly, since the Likert scale questions were used for perceived social relationships, adolescents with poor mental health and/or who were unsatisfied with just one social relationship, may have tended to report worse perceptions of other social relationships (instrument effect). In addition, a cross-sectional design could lead to possible reverse causality relationships between exposures and outcomes. In this sense, it is not clear if unhealthy behaviors and poor mental health could lead the subject to poor perceived social relationships or vice-versa. Therefore, we cannot point causality. On the other hand, we tested and showed the reproducibility indicators of the questionnaire used. Given that perceived social relationships reflect the actual perceptual moment of the adolescent, we observed acceptable values for teachers (0.69), but relatively moderate to low values for family (0.53) and friends (0.49). Similarly, the reproducibility of self-perception of stress (0.80) and sadness (0.62), as well as fat consumption (0.74), tobacco smoking (0.78), alcohol consumption (0.89), and screen time (0.79) were acceptable. In addition, we used an objective and valid indicator of somatic maturation<sup>38</sup>, which allowed a rare analysis of social-biological interaction. Thus, given the

context of the study and sample size, the current findings contribute to the understanding of the association between social, behavioral and biological variables among adolescents, especially in the context of low-to-middle income countries.

Finally, we conclude that self-perceived social relationships are related to health risk behaviors,

mental health, and academic performance in adolescents. Adolescents who smoked tobacco, had a higher consumption of alcohol and fat, greater screen time, delayed maturation, with greater feelings of stress and sadness, and poor academic achievement were more likely to be dissatisfied with their social relationships.

## Collaborations

DRP Silva: substantial contributions to the conception or design of the work; the acquisition, analysis, and interpretation of data for the work; drafting the work. AO Werneck: substantial contributions to the conception or design of the work; interpretation of data for the work; drafting the work. RR Agostinete and AA Bastos: interpretation of data for the work; revising the draft critically for important intellectual content. RA Fernandes, ERV Ronque and ES Cyrino: substantial contributions to the conception or design of the work; revising the draft critically for important intellectual content. All authors read and approved the final version of the manuscript and all agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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