



## Physical activity level, screen time and sleep duration according to sociodemographic data of students

*Nível de atividade física, tempo de tela e duração do sono de acordo com dados sociodemográficos de escolares*

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### ABSTRACT

This study aimed to compare physical activity levels, sleep duration and screen time with sociodemographic factors in adolescents in 95 students aged between 14 and 18 years. Adolescents answered sociodemographic questionnaire, Physical Activity Questionnaire for Adolescents and self-reported questions about screen time and sleep duration. The Mann-Whitney U Test was applied. It was observed that 80% of the adolescents did not follow the recommendations for physical activity levels, 54.7% for sleep duration, and 77.9% for screen time. Males presented higher physical activity levels than girls, students attending the afternoon shift presented more sleeping hours on weekdays and participants with higher family income showed higher screen time and lower sleep duration on weekdays. It was concluded that from the studied adolescents, sociodemographic factors such as sex, study shift and family income influence physical activity levels, sleep duration and screen time of students.

**Keywords:** Adolescents. Sedentary behavior. School health. Sleep.

### RESUMO

Este estudo teve como objetivo comparar os níveis de atividade física (NAF), duração de sono e tempo de tela conforme fatores sociodemográficos de 95 adolescentes da faixa etária entre 14 e 18 anos. Os adolescentes responderam questionário sociodemográfico, *Physical Activity Questionnaire for Adolescents* e questões de autorrelato sobre o tempo de tela e duração do sono. Foi aplicado o Teste U de Mann-Whitney. Observou-se que 80% dos escolares não atendem às recomendações de atividade física, 54,7%, de horas de sono, e 77,9%, de tempo de tela. O sexo masculino apresentou maior NAF, escolares do turno vespertino tiveram mais horas de sono nos dias úteis e entre participantes com maior renda houve maior tempo de tela e menos horas de sono nos dias úteis. Concluiu-se que os fatores sociodemográficos como sexo, turno de estudo e renda mensal influenciam o NAF, a duração do sono e o tempo de tela de escolares.

**Palavras-chave:** Adolescentes. Comportamento sedentário. Saúde escolar. Sono.

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## INTRODUCTION

Adolescence, considered a transition from childhood to adulthood, provides important biological, cognitive, emotional and social changes<sup>1</sup>. Among the changes, evidence points to changes in behaviors related to decreased physical activity<sup>1</sup>, insufficient sleep<sup>2</sup> and increased screen time<sup>3</sup>. With the growing recognition of the importance of all movement behaviors (physical activity, sedentary behavior and sleep) in a 24-hour period<sup>4</sup>, studying these variables in more vulnerable groups becomes imperative to improve health.

Adequate levels of physical activity<sup>5</sup>, screen time<sup>2</sup> and sleep<sup>3</sup> are recognized in the literature as essential for the growth and development of adolescents. The daily organization of the rest-activity cycle can be more fragmented in this group, especially among the obese and with lower cardiorespiratory function, and is correlated with greater metabolic risk.<sup>6</sup> Still, disturbances of sleep and circadian rhythm are also commonly seen since adolescents to shift workers and can promote numerous diseases ranging from abnormal metabolism, heart disease, reduced immunity, increased stress, abnormal cognition and mood states.<sup>6</sup>

A recent study that analyzed the adoption of healthy lifestyles among teenage students in Brazil from 2009 to 2015 found a decrease in the proportion of those physically active in all socioeconomic strata; this raised concerns about the extensive loss of health benefits from regular exercise among these groups.<sup>7</sup> In addition, sedentary behavior regarding recreational screen time (for example, electronic media such as TV, smartphones, computers, video games, etc.) has been associated with a variety of damage to the health of children and adolescents.<sup>8</sup>

In this context, studies indicate that the practice of physical activity, sedentary behavior and sleep are variables of movement behavior that may be influenced by sociodemographic factors.<sup>9,10,11</sup> Thus, in order to study the achievement of the appropriate level of physical activity, reduced screen time and adequate sleep duration, understanding which groups are most

vulnerable can help in planning preventive strategies in school settings.

In addition to investigating factors such as age, sex and income, research shows that the mother's schooling<sup>11</sup> and the geographic area in which adolescents live can influence the way the built environment promotes physical activity and health behaviors.<sup>12</sup> Therefore, it makes it is also important to analyze movement behavior variables according to urbanity (urban, rural).<sup>9</sup>

The literature points out that sociodemographic factors, such as female gender, older age (those aged 18 or over), place of residence, mother's low level of education and lower family income, are related to lower levels of physical activity in adolescents.<sup>11,12</sup> On the other hand, it is observed that the sociodemographic data referring to the female gender, mother's education and socioeconomic level<sup>12,13</sup> are associated with a total screen time above the recommended.

With regard to sleep duration, there are studies that show that sociodemographic factors such as older age, female gender, lower perceived socioeconomic level<sup>14</sup> and school start time<sup>15</sup> are related to greater sleep deprivation. In addition, lower social class and not using computers at night have been classified as independent predictors of adequate sleep duration during the week.<sup>16,17</sup>

Although the guidelines on this theme are well established - do 60 minutes or more of moderate to vigorous daily physical activity<sup>18</sup> (WHO), sleep an average of eight to ten hours a night<sup>4</sup> and use the recreational screen time of up to two hours per day, teenagers are not meeting the recommendations.<sup>1</sup>

Thus, it is identified that there is a need to understand the most vulnerable sociodemographic groups, with the aim of visualizing those that demand greater attention in health promotion actions. Thus, this research aimed to compare the levels of physical activity, screen time and sleep duration between the sociodemographic data of school adolescents.

## METHODOLOGY

### STUDY DESIGN, ETHICAL ASPECTS AND SAMPLE CHARACTERISTICS

This study is a partial of the project entitled “Level of physical activity, screen time and sleep duration of school students and its association with cardiometabolic risk factors”. This is a field research with a cross-sectional quantitative-descriptive approach.

The project was submitted to the Research Ethics Committee of the Federal University of Vale do São Francisco designated by Plataforma Brasil, CAAE 20875019.0.0000.5196, in compliance with the guidelines and regulatory standards determined by Resolution 466/2012 of the National Health Council. It was authorized by the institution and was introduced to teenagers who agreed to take part voluntarily. Thus, participants and the legal guardians were asked to sign the Informed Consent Form (ICF).

This study used a convenience sample, consisting of students aged 14 to 18 years old regularly enrolled in the courses of the IFMA/Campus Presidente Dutra. Adolescents were recruited through the dissemination of the project in the school’s classrooms and murals, and a meeting was also held to present the project. The research included those who were within the defined age group and who accepted to participate voluntarily. Students were excluded if they refused to continue participating.

Data were collected in March 2020 (two weeks before the decree to close public schools due to the COVID-19 pandemic), with questionnaires applied in the classroom with a maximum of 15 students at a time; the activity was guided by an experienced researcher capable of clarifying the participants’ doubts. After signing and collecting the ICF, they answered questions related to sociodemographic data, physical activity level, recreational screen time and sleep duration, totaling an average time of 25 minutes.

## COLLECTION PROCEDURES AND VARIABLES

### Sociodemographic and lifestyle characteristics

In this study, a questionnaire was used with sociodemographic data that included the following items: sex (female or male), age (complete years), housing area (urban or rural), family income (up to a minimum wage and above one minimum wage) and mother’s education (illiterate to high school, complete higher education).

The analysis of the physical activity level (PAL) was done through the Physical Activity Questionnaire for Adolescents (PAQ-A). This instrument, translated, adapted and validated for young Brazilians by Guedes and Guedes,<sup>19</sup> consists of eight items, which have a five-point response scale, which allows to establish a score equivalent to the level of physical activity practice computed by intermediate arithmetic mean of each item. As found by Benítez-Porres<sup>20</sup>, the PAQ-A is a useful tool, and the score of 2.75 can be used as a reference for classifying adolescents as active or inactive.

Sedentary behavior defined as screen time was self-reported by the time spent in front of an electronic media. Two questions were used, which Guedes and Lopes<sup>21</sup> adapted and validated for young Brazilians and demonstrated agreement using the kappa index  $\geq 50\%$  in replicates of application. These questions refer to recreational screen time (TV, video games and computer use for activities not related to school work) in the last week, with alternatives for the amount of time spent on these activities on weekdays and on weekends. Participants were classified based on the total screen time spent per day as follows:  $< 2$  hours/day and  $\geq 2$  hours/day, according to the guidelines of the American Academy of Pediatrics.<sup>22</sup>

Sleep duration was self-reported using a questionnaire adapted by Hayes et al.<sup>23</sup> of the Pittsburgh Sleep Quality Index<sup>24</sup>. This adaptation consists of four self-report items about the time when teenagers go to sleep and the time they wake up, both on weekdays and on weekends during the previous month. Canadian 24-hour Movement Guidelines<sup>4</sup> recommend that young people aged 13 to 18 sleep an average of eight

to ten hours a night. Thus, regarding sleep duration, we classified the sample into two groups: those who slept more than eight hours, and those who slept less.

#### DATA ANALYSIS

To characterize the study population, variables were initially examined using descriptive analyses (means, medians, interquartile range and standard deviation). Then, the prevalence of physical inactivity, sedentary lifestyle regarding screen time and sleep duration were estimated according to independent variables with the respective standard deviation. The

Kolmogorov-Smirnov test revealed that the variables did not have a normal distribution. Thus, to compare the level of physical activity, screen time and sleep duration between binary variables, the Mann-Whitney U Test was applied. Statistical analysis was conducted using SPSS software version 22.0 for Windows. The level of significance was set at a value of  $p < 0.05$ .

#### RESULTS

The sample consisted of 95 students between 14 and 18 years old, with an average of 15.18 years ( $\pm$

0.92), and a predominance of 51.5% ( $n = 49$ ) of the female sex. Table 1 lists the sociodemographic characteristics of the studied group.

**Table 1.** Sociodemographic characteristics of the total sample and divided by sex

Variable	Total		Male		Female	
	Nº	%	Nº	%	Nº	%
Age (years)						
14 to 15	70	73.7	31	44.3	39	55.7
16 to 18	25	26.3	15	60.0	10	40.0
Housing area						
Urban	78	82.0	39	50.0	39	50.0
Rural	15	15.8	6	40.0	9	60.0
School shift						
Morning	64	67.4	34	53.1	30	46.9
Afternoon	31	32.6	12	38.7	19	61.3
Family income						
Up to 1 MW <sup>a</sup>	48	50.5	17	35.4	31	64.6
Above 1 MW	47	49.5	29	61.7	18	38.3
Mother education						
Higher education	30	31.6	18	60.0	12	40.0
Up to complete high school	51	53.6	23	45.0	28	55.0

MW – minimum wage. <sup>a</sup>Minimum wage considered: R\$ 998.00.

Source: research data

Regarding the physical activity level, 80% (n = 76) of the sample was classified as insufficiently active, and 12.5% (n = 12), sufficiently active. Of the total, it was not possible to classify 7.5% (n = 7), due to incomplete answers in the questionnaire. Of the insufficiently active adolescents, 55% (n = 42) belonged to the group of those whose mother was between illiterate to complete high school. Another important finding is that 21% (n = 20) of the participants reported being unable to perform physical activity, of which 75% (n = 15) for health reasons, and 25% (n = 5) because they were busy with school tasks, due to indisposition, car accident and "not having time".

The results indicated that, during the week (Monday to Friday), only 22.1% (n = 21) of students had screen time less than two hours/day, and 77.9% (n = 74), equal to or greater than two hours /day. At the weekend, the responses indicated that only

10.5% (n = 10) had screen time less than two hours/day, and 89.5% (n = 85), equal to or greater than two hours/day.

As for the behavior related to sleeping and waking hours, the average sleep duration in the week was 7 hours and 22 minutes a day ( $\pm 1.52$  h), and at the weekend, 9 hours and 24 hours minutes per day ( $\pm 1.42$  h). During the week, 54.7% (n = 52) slept less than eight hours a day, and 29.5% (n = 28) slept eight or more hours a day.

Table 2 lists the comparison of the physical activity level, screen time and hours of sleep between genders. There was a significant difference when comparing the physical activity level, with a median of higher score for males.

**Table 2.** Comparison of average physical activity level, screen time and sleep duration between genders

	Male (n = 46)	Confidence interval	Female (n = 49)	Confidence interval	p-value
PAL	2.26 (1.67 – 2.51)	(2.01 - 2.33)	1.70 (1.54 – 2.09)	(1.75 - 2.15)	<b>0.035*</b>
ST per day on weekdays (hours)	4.00 (2.00 – 5.00)	(5.49 - 7.02)	4.00 (2.00 – 6.00)	(5.67 - 7.24)	0.708
ST on the weekend (hours)	5.50 (3.50 – 7.00)	(7.04 - 8.78)	6.00 (2.50 – 6.50)	(7.09 - 9.13)	0.776
Sleep hours per day on weekdays	7.00 (5.45 – 8.00)	(6.56 - 7.47)	7.00 (6.15 – 8.00)	(6.94 - 7.96)	0.480
Sleep hours per day on the weekend	9.50 (8.50 – 10.25)	(9.01 - 9.91)	9.00 (8.00 – 10.00)	(8.63 - 9.48)	0.326

Mann Whitney Test. PAL – physical activity level. ST – screen time. \* p < 0.05; p-values lower than 0.05 are highlighted in bold.

Source: research data

Table 3 presents the comparison of the physical activity level, screen time and hours of sleep between groups divided by the housing area. Although the results did not show significant differences, this study considers that the characteristics of the built environment are important determinants of physical activity for children and adolescents.

**Table 3.** Comparison of average physical activity level, screen time and sleep duration between groups according to the housing area

	Urban (n = 78)	Confidence interval	Rural (n = 15)	Confidence interval	p-value
PAL	1.92 (1.60 – 2.54)	(1.95 – 2.24)	1.80 (1.34 – 2.37)	(1.51 – 2.28)	0.237
ST per day on weekdays (hours)	4.00 (2.00 – 5.50)	(3.20 – 4.28)	3.00 (1.00 – 5.00)	(2.20 – 4.46)	0.717
ST on the weekend (hours)	5.50 (3.50 – 7.00)	(4.78 – 6.00)	3.50 (2.00 – 6.00)	(2.63 – 6.10)	0.238
Sleep hours per day on weekdays	7.00 (6.30 – 8.00)	(6.82 – 7.59)	7.80 (6.50 – 9.00)	(6.90 – 8.49)	0.320
Sleep hours per day on the weekend	9.50 (8.50 – 10.00)	(9.01 – 9.69)	8.75 (8.00 – 10.00)	(7.96 – 9.65)	0.183

Mann Whitney Test. PAL – physical activity level. ST – screen time.

Source: research data

When comparing the means of the physical activity level, screen time and sleep duration according to the school shift, it was noticed that there was a statistical difference for sleep duration, with a higher median (8.00) for the afternoon shift class (Table 4).

**Table 4.** Comparison of average physical activity level, screen time and sleep duration between groups according to the school shift

	Morning (n = 64)	Confidence interval	Afternoon (n = 31)	Confidence interval	p-value
PAL	1.85 (1.59 – 2.42)	(1.90 – 2.21)	1.93 (1.51 – 2.62)	(1.82 – 2.32)	0.982
ST per day on weekdays (hours)	4.00 (2.25 – 6.00)	(3.39 – 4.51)	3.00 (1.00 – 4.00)	(2.35 – 4.19)	0.087
ST on the weekend (hours)	5.75 (3.25 – 7.50)	(4.84 – 6.23)	5.50 (2.50 – 6.00)	(3.77 – 5.83)	0.197
Sleep hours per day on weekdays	6.75 (5.95 – 7.42)	(6.37 – 7.00)	8.00 (7.50 – 9.57)	(7.78 – 9.04)	<b>0.000*</b>
Sleep hours per day on the weekend	9.50 (8.50 – 10.00)	(9.03 – 9.65)	9.00 (8.50 – 10.00)	(8.36 – 9.78)	0.591

Mann Whitney Test. PAL – physical activity level. ST – screen time. \* p < 0.05; p-values lower than 0.05 are highlighted in bold.

Source: research data

When examining the aforementioned variables of behaviors related to movement between groups divided according to the reported family income (Table 5), it was evident that there was a statistical difference in screen time, and participants with higher monthly income had higher values. On the other hand, sleep duration on weekdays were higher in individuals with lower monthly income.

**Table 5.** Comparison of average physical activity level, screen time and sleep duration between groups according to family income

	Up to one minimum wage (n=48)	Confidence Interval	More than one minimum wage (n=45)	Confidence Interval	p-value
PAL	1,74 (1,52 – 2,42)	(1,81 – 2,19)	1,98 (1,62 – 2,50)	(1,92 – 2,30)	0,378
ST per day on weekdays (hours)	3,00 (1,00 – 5,00)	(5,18 – 6,79)	4,00 (2,50 – 6,00)	(6,01 – 7,49)	<b>0,039*</b>
ST on the weekend (hours)	5,50 (3,00 – 6,00)	(6,85 – 8,76)	6,00 (3,75 – 7,50)	(7,20 – 9,10)	0,193
Sleep hours per day on weekdays	7,60 (6,95 – 8,62)	(7,15 – 8,10)	6,85 (5,80 – 7,92)	(6,37 – 7,28)	<b>0,012*</b>
Sleep hours per day on the weekend	9,00 (8,00 – 10,00)	(8,68 – 9,69)	9,00 (8,50 – 10,00)	(8,87 – 9,65)	0,967

Mann Whitney Test. PAL – physical activity level. ST – screen time. \* p < 0.05; p-values lower than 0.05 are highlighted in bold.

Source: research data

Finally, an analysis was made of the comparison of movement behavior variables between groups divided by mother's education. However, no significant differences were detected between the groups, as shown in Table 6.

**Table 6.** Comparison of average physical activity level, screen time and sleep duration between groups according to mother's education level

	Illiterate to complete high school (n = 51)	Confidence interval	Complete higher education (n = 30)	Confidence interval	p-value
PAL	1.74 (1.52 – 2.21)	(1.78 – 2.14)	2.16 (1.61 – 2.54)	(1.92 – 2.36)	0.131
ST per day on weekdays (hours)	3.50 (2.00 – 6.00)	(3.02 – 4.34)	3.75 (2.00 – 5.50)	(2.85 – 4.54)	0.976
ST on the weekend (hours)	5.50 (3.00 – 7.00)	(4.19 – 5.74)	6.00 (3.50 – 7.00)	(4.50 – 6.73)	0.312
Sleep hours per day on weekdays	7.00 (6.00 – 8.00)	(6.61- 7.62)	7.70 (6.30 – 8.20)	(6.74 – 7.93)	0.466
Sleep hours per day on the weekend	9.75 (8.50 – 10.00)	(9.22 – 10.04)	9.00 (8.50 – 9.87)	(8.88 – 9.68)	0.301

Mann Whitney Test. PAL – physical activity level. ST – screen time.

Source: research data

## DISCUSSION

The present study aimed to identify the differences in movement behaviors, physical activity levels, screen time and hours of sleep taking into account the sociodemographic aspects, sex, housing area, school shift, family income and schooling of the students' mothers. It was observed that the variable PAL presented statistical difference regarding the groups divided by sex. The screen time per working day was statistically different between those divided according to family income, and the one related to sleep hours on weekdays highlighted a statistical difference for the groups according to the school shift and family income.

Furthermore, the findings indicate an increase in the number of adolescents who do not follow the recommendation for physical activity (80%), classified as insufficiently active, just like the world scenario<sup>5</sup>, and only 12.5% (n = 12) are sufficiently active. Still, 22.1% (n = 21) had screen time less than two hours/day, and 77.9%, equal to or greater than two hours/day on weekdays, corroborating Prado et al.<sup>3</sup> The prevalence of participants with longer screen time (equal to or greater than two hours/day on weekends) was higher (89.5%).

The results revealed that sleep duration on weekends averaged 9 hours and 24 minutes; however, this time during the week was, on average, 7 hours and 22 minutes, lower than recommended (sleeping an average of eight to ten hours a night<sup>4</sup>), in agreement with the research by Keyes et al.<sup>2</sup> The prevalence of sleep deprivation was higher on weekdays versus weekends, similarly to other studies with adolescents.<sup>14, 17</sup>

A significant difference was detected regarding the PAL divided by sex, in which boys presented higher levels. This finding agrees with several studies already available in the literature that show that male adolescents are more encouraged to practice sports and physical activity as a way of socializing and increasing popularity, while female adolescents perform social activities with less energy

expenditure, such as meetings at friends' houses and outings at malls.<sup>10,11</sup>

There was no statistical difference between groups divided by housing area. Possibly, the small number of rural participants may have influenced this finding. However, there are studies in the literature that reveal that children and adolescents in rural areas engage more in physical activities than those in urban areas.<sup>25</sup> According to Euler et al.<sup>25</sup>, these differences may be related to access to electronic media and the internet. As connectivity to the web is lower and less available in more rural settings and, on the other hand, very common in urban settings, sedentary time tends to be higher among youth living in urban areas.<sup>25</sup>

There was a significant difference between the sleep duration in the week with regard to school shifts, with a higher median of sleep for the afternoon, which does not routinely need to wake up early to go to school. Indices of adolescents who report sleeping less than the required eight hours are often attributed to extrinsic factors<sup>15</sup>, including the start time of classes, and are also related to biological factors.<sup>26, 27</sup>

In addition to the low sleep duration, the results show that there is a tendency for students who study in the morning to have more screen time per day during school days. According to Louzada and Pereira<sup>28</sup>, the puberty period promotes hormonal changes that allow adolescents to stay awake for longer, which can lead to an increase in screen time. In this way, two propositions could be made to avoid sleep deprivation among those who study in the morning: implementation of educational projects for adequate sleep and changing the start time of classes.

Still, the present study pointed to a statistical difference in sleep hours and screen time on weekdays between the groups separated according to income. Adolescents who reported having a family income higher than a minimum wage had a sleep duration below the recommendations and longer time in front of the screen on weekdays. It is believed that the fact that they have a higher family income increases the probability of having access to electronic media, internet and TV in the bedroom. This corroborates the longitudinal research by Schäfer et al.<sup>29</sup>, who investigated factors associated with



sleep duration in adolescence with young Brazilians. Excessive screen time can come at the expense of sleep duration, and nighttime exposure to light emitted by self-luminous devices can affect melatonin production time and, consequently, cause circadian disturbance.<sup>30</sup>

With regard to the mother's education, no statistical differences were detected between these groups when comparing the average of PAL, screen time and sleep duration. It is believed that this result is due to the profile and specificities of each group of this population. However, the National School Health Survey (PeNSE)<sup>1</sup> considers that the mother's and father's education levels are protective factors for the health of children and adolescents. Furthermore, adolescents with high sedentary behavior and low level of physical activity are more likely to be from groups of mothers with low education.<sup>8</sup>

Some limitations should be considered when interpreting the findings of the present study. Initially, because it is a cross-sectional study, the cause-and-effect relationship for the results cannot be established. Still, although the instruments used are well grounded in the literature, there is a bias related to the self-report of variables. In this sense, it is suggested that future research address the theme through a longitudinal design that uses instruments capable of directly measuring the physical activity level, sleep duration and screen time of students.

## CONCLUSION

The present study revealed that most adolescents do not follow the recommendations for physical activity, screen time and sleep duration. In addition, boys have higher PAL than girls, and participants with a family income above a minimum wage obtained longer screen time and shorter sleep duration on school days. The morning shift group had lower values for sleep duration on school days.

The results contribute to a greater understanding of the behaviors related to movement and sociodemographic factors of adolescent students. Based on them, it is possible to deepen the discussion

on the theme and implement educational and awareness actions regarding the controlled use of electronic devices, adequate sleep hours, incentive to practice physical activity and strategies to rethink the class hours of students in the morning shift.

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