

SOCIAL DISTANCING IN PANDEMIC TIMES: IMPACT ON ACTIVE AND SEDENTARY BEHAVIOR OF SCHOOL STUDENTS

DISTANCIAMENTO SOCIAL EM TEMPOS DE PANDEMIA: IMPACTO NO COMPORTAMENTO ATIVO E SEDENTÁRIO DE ESCOLARES

DISTANCIAMIENTO SOCIAL EN TIEMPOS DE PANDEMIA: IMPACTO EN EL COMPORTAMIENTO ACTIVO Y SEDENTARIO DE LOS ESCOLARES



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ABSTRACT: Low level of physical activity (PAL) and high rates of sedentary behavior (SB) in adolescents are cause for concern. The aim was to analyze the impact of social distancing (SDi) on active behavior (AB) and SB in 276 high school students (age: 16.1±1.0 years) of a federal public school in southern Brazil, during the COVID-19 pandemic. Participants answered about the AB and SB routine in a typical week (before and during DiS) in 2020. AB decreased both in time of physical activity practice (360.1±172.5 to 215.8±167.2 min /week; p<0.000) as in days of weekly practice (4.1±1.4 to 3.2±1.9 days/week; p<0.000). SB increased (480 to 720 min/day). It is concluded that the impact of SDi was unfavorable for AB and SB. Therefore, school and school Physical Education should be recognized as a space and opportunity to carry out physical practices, meeting the PAL recommendations for this population.

KEYWORDS: School physical education. Basic education. Level of physical activity. Screen time. COVID-19.

RESUMO: Baixo nível de atividade física (NAF) e altos índices de comportamento sedentário (CS) de adolescentes são motivos de preocupação. O objetivo foi analisar o impacto do distanciamento social (DiS) no comportamento ativo (CA) e CS em 276 escolares (idade: 16,1±1,0 anos) do ensino médio de uma escola pública federal do Sul do Brasil, durante a pandemia de COVID-19. Os participantes responderam sobre a rotina de CA e CS em uma semana típica (antes e durante DiS) em 2020. O CA diminuiu quanto ao tempo de prática de atividades físicas (360,1±172,5 para 215,8±167,2 min/semana; p<0,000) e dias de prática semanal (4,1±1,4 para 3,2±1,9 dias/semana; p<0,000). O CS aumentou (480 para 720 min/dia). Conclui-se que o impacto do DiS foi desfavorável para CA e CS. Portanto, escola e Educação Física escolar devem ser reconhecidas como espaço de oportunidade na realização das práticas corporais, contribuindo no atendimento às recomendações de NAF desta população.

PALAVRAS-CHAVE: Educação física escolar. Educação básica. Nível de atividade física. Tempo de tela. COVID-19.

RESUMEN: El bajo nivel de actividad física (NAF) y los altos índices de comportamiento sedentario (CS) en adolescentes son motivo de preocupación. El objetivo fue analizar el impacto del distanciamiento social (DiS) en el comportamiento activo (CA) y CS en 276 estudiantes de secundaria (edad: 16,1±1,0 años) de una escuela pública federal en el sur de Brasil, durante la pandemia de COVID-19. Los participantes respondieron sobre la rutina de CA y CS en una semana típica (antes y durante el DiS) en 2020. El CA disminuyó en el tiempo de práctica de actividad física (360,1±172,5 a 215,8±167,2 min/semana; p<0,000) y en los días de práctica semanal (4,1±1,4 a 3,2±1,9 días/semana; p<0,000). El CS aumentó (480 a 720 min/día). Se concluye que el impacto de DiS fue desfavorable para CA y CS. Por lo tanto, la escuela y la Educación Física escolar deben ser reconocidas como espacio y oportunidad para la realización de prácticas corporales, contribuyendo al cumplimiento de las recomendaciones de NAF para esta población.

PALABRAS CLAVE: Educación física escolar. Educación básica. Nivel de actividad física. Tiempo frente a la pantalla. COVID-19.

Introduction

Healthy behaviors carried out throughout the day are predictors of good health and quality of life in adolescents (Vaquero-Solís *et al.*, 2021). However, the level of physical activity (PAL) of this population is a subject of attention from the global scientific community. Recently, Guthold *et al.* (2020) observed a global prevalence of 81% of insufficiently active adolescents, which is a behavior negatively associated with self-rated health in this population (Zhang; Lu; Wu, 2020).

This evidence is further aggravated by the fact that a long period of sedentary behavior (SB) exposes adolescents to the development of cardiometabolic diseases, regardless of PAL (Silva Filho *et al.*, 2020). In addition to the negative effects on health in general, there is concern about the impact of this behavior on life expectancy and its consequences for public health (Chaput *et al.*, 2020; Zhang; Lu; Wu, 2020).

On a positive note, school is at the center of opportunities for adolescents to increase their PAL. Active commuting to school, physical education classes, breaks between classes (recess), sports schools and several other activities are possibilities to encourage this behavior. On the contrary, after-school hours (post-school daytime) can generate excessive CS in adolescents. There is evidence that they adopt these behaviors in almost half of the post-school period, including the use of screens (television, smartphone, video games, tablets and computers) and, despite health bodies warning of the need to reduce time in CS, most exceed recommendations (Arundell *et al.*, 2016).

Although inevitable, it is possible that the COVID-19 (SARS-CoV-2) pandemic has worsened this situation, as opportunities for active behavior (CA) were affected by the closure of schools. In Brazil, the effects of community spread were noticed from March 2020, and the World Health Organization (WHO) recommended isolation and social distancing actions (DiS). In this sense, the Ministry of Education followed WHO guidelines and determined that in-person classes would become virtual (Brazil, CNE, 2020). The DiS recommendations and the change in class format impacted the physical activity and CS patterns of students (Yomoda; Kurita, 2021; Brito *et al.*, 2020; Pietrobelli *et al.*, 2020; Schmidt *et al.*, 2020).

Therefore, the present study aimed to analyze the impact of DiS on the active and sedentary behaviors of high school students at a federal public school in the South of Brazil, during the COVID-19 pandemic.

Methodological Paths

The convenience sample consisted of 276 students enrolled in high school (1st, 2nd and 3rd years) at a federal public school in the southern region of Brazil. For data collection, a questionnaire was prepared including questions to characterize the sample (age, sex). This instrument was built and made available via Google Forms, in a very simple way, so that participants could respond while respecting DiS. The invitation to participate in the study was made through the Learning Environment (Moodle) used by the Educational Institution. The survey was available to be answered in the first fortnight of June 2020. Before the questions began, the Informed Consent and Assent Form was presented, with a description of the objectives and procedures for participation. Afterwards, he was asked: “Do you agree to participate in this study?” When selecting the “yes” option, the questionnaire started and, if you chose “no”, it ended automatically.

Students were asked to think about their physical activity and CS routine in a typical week, before the isolation period, and during that period. Regarding PAL, questions were asked about the amount of physical activity performed (in min/day) and modalities practiced. With regard to CS (in hours/day), the questions were distributed as follows: use of screens for study routine (PC), hours of television (TV) and screen time (TT, for *tempo de tela*, in Portuguese) intended for leisure (social networks and video games).

The research was conducted in accordance with the principles of the Declaration of Helsinki and Resolution 466/12 of the Ministry of Health, which regulates research with human beings in Brazil, and was assessed and approved by the Ethics Committee for Research with Human Beings.

The data were processed and presented using descriptive statistical analysis, with measures of central tendency and dispersion. To verify the normality of the data, the Kolmogorov-Smirnov test was applied, and for multiple comparisons, the Friedman test with Dunn's post hoc test. The significance level adopted was 5% and the data were processed using the SPSS 20.0 statistical package.

Results

276 high school students participated, with an average age of 16.1 ± 1.0 years. When stratifying the group by sex, there were 158 girls and 118 boys. The results regarding active and sedentary behaviors are presented in Table 1.

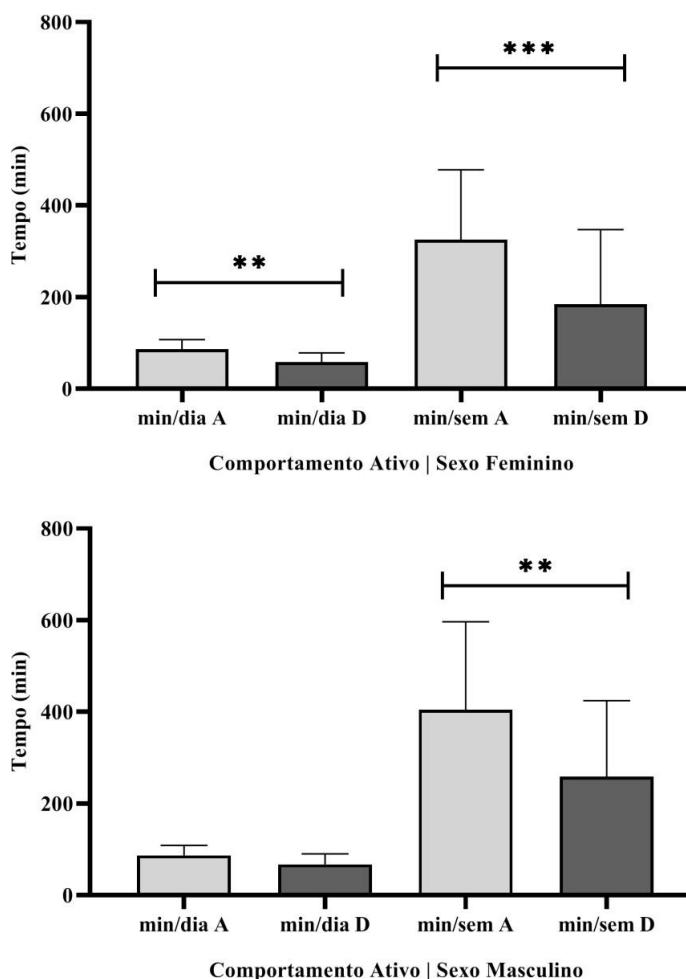
Table 1 – Active and sedentary behaviors of high school students.

Behavior	High School Students (n=276)					
	Before		During		Δ (abs.)	% (rel.)
	MD	Min – Max	MD	Min - Max		
Active						
Days/week.	4.1	2 – 7	3.2	0 - 7	-0.9	-25.0
Min/day	90	30 – 120	60	0 - 120	-30	-33.3
Min/wk.	360	60 – 840	180	0 - 840	-180	-50.0
Sedentary						
TV min/day	60	0 – 540	120	0 – 600	60	100
PC min/day	180	0 – 600	300	0 – 600	120	66.7
TT min/day	240	0 – 600	300	0 – 600	60	25.0

Source: Written by the author. Caption: Before and during refer to the social isolation imposed by government health bodies, as a result of the COVID-19 pandemic; TV: television screen time; PC: computer screen time; TT: leisure screen time (social networks and games); Md: median; Min – Max: minimum and maximum values; Δ : absolute value of the variation in the median between moments during – before; %: relative value of the variation; sem.: week.

In relation to CA, there was a decrease in the average, both in the time spent practicing physical activities (from 360.1 ± 172.5 min/week to 215.8 ± 167.2 min/week; $p < 0.000$), and in the number of days of weekly practice (from 4.1 ± 1.4 to 3.2 ± 1.9 days; $p < 0.000$). When stratifying participants by sex, the analysis of weekly physical activity time showed a difference between the periods before and during the pandemic, in both sexes (female: from 325.3 ± 152.8 to 184.5 ± 162.6 min /week; $p < 0.000$; male: from 404.7 ± 191.9 to 259.1 ± 165.6 min/week; $p < 0.004$). In daily PAL, there was a difference only for females (from 86.4 ± 20.9 to 58.4 ± 20.0 min/day; $p = 0.004$) (Figure 1). However, despite decreasing PAL, both sexes managed to remain active for at least three days a week on average.

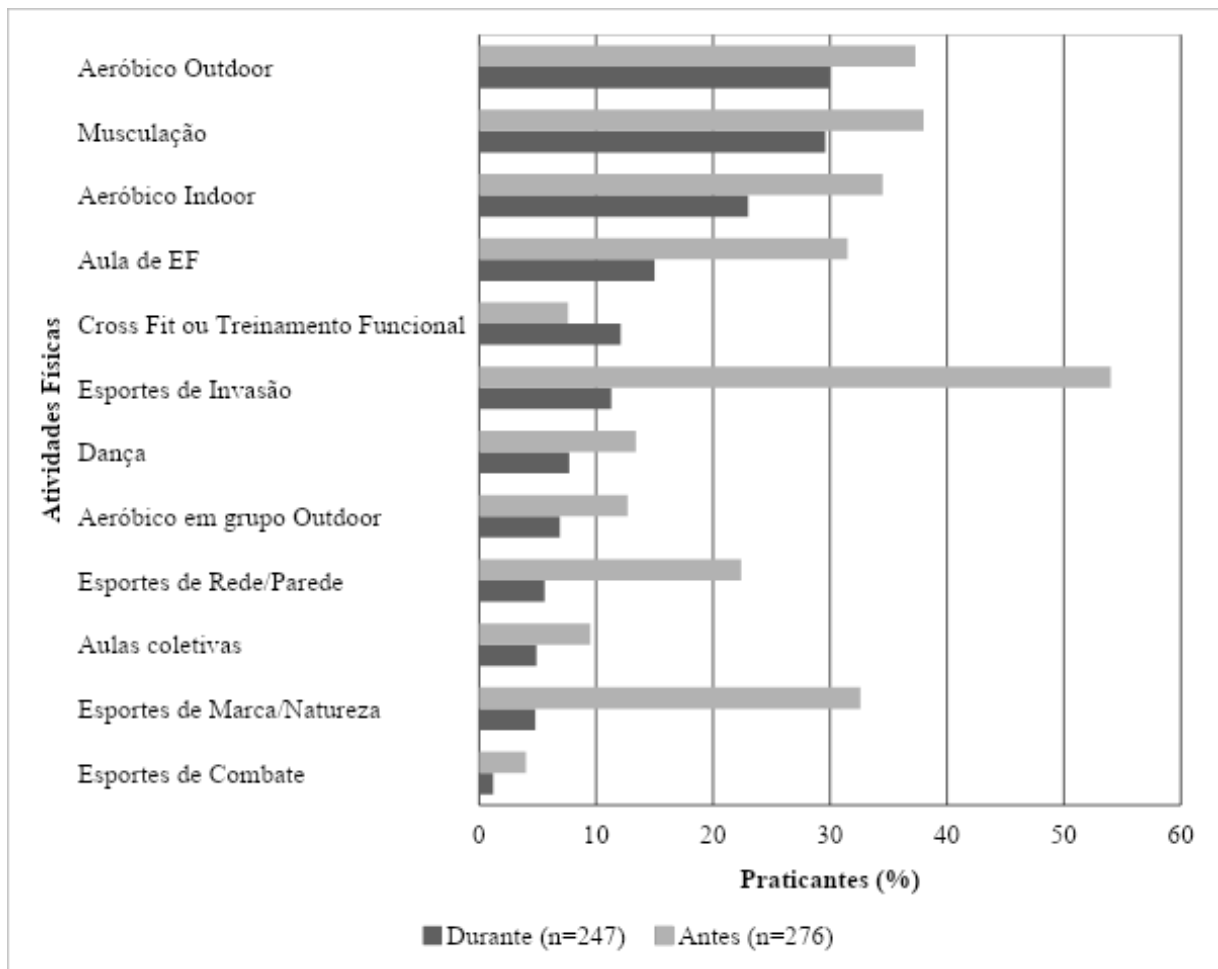
Figure 1 – Active behavior of high school students, stratified by sex.



Source: Prepared by the authors. Legend: min/day A: minutes per day (before); min/day D: minutes per day (during); min/week A: minutes per week (before); min/week D: minutes per week (during). Multiple and paired comparisons: Friedman's test and Dunn's post hoc test; Significance level: $\alpha=0.05$.

Adolescents were also asked about the type of physical activity practiced before and during the pandemic (Figure 2). Among the activities mentioned, the 42.5% increase in the practice of CrossFit or Functional Training stood out. The biggest drops were 86.8% in brand/adventure sports (athletics, swimming and orienteering) and 81.2% in invasion sports (handball, field football, futsal, basketball, American football and rugby). In reference to Physical Education classes, 31.5% (n=87) of students reported that this was the only weekly time they performed physical activity before social isolation. During the pandemic, only 15% (n=37) continued this practice.

Figure 2 – Physical activities practiced by high school students, before and during the pandemic period



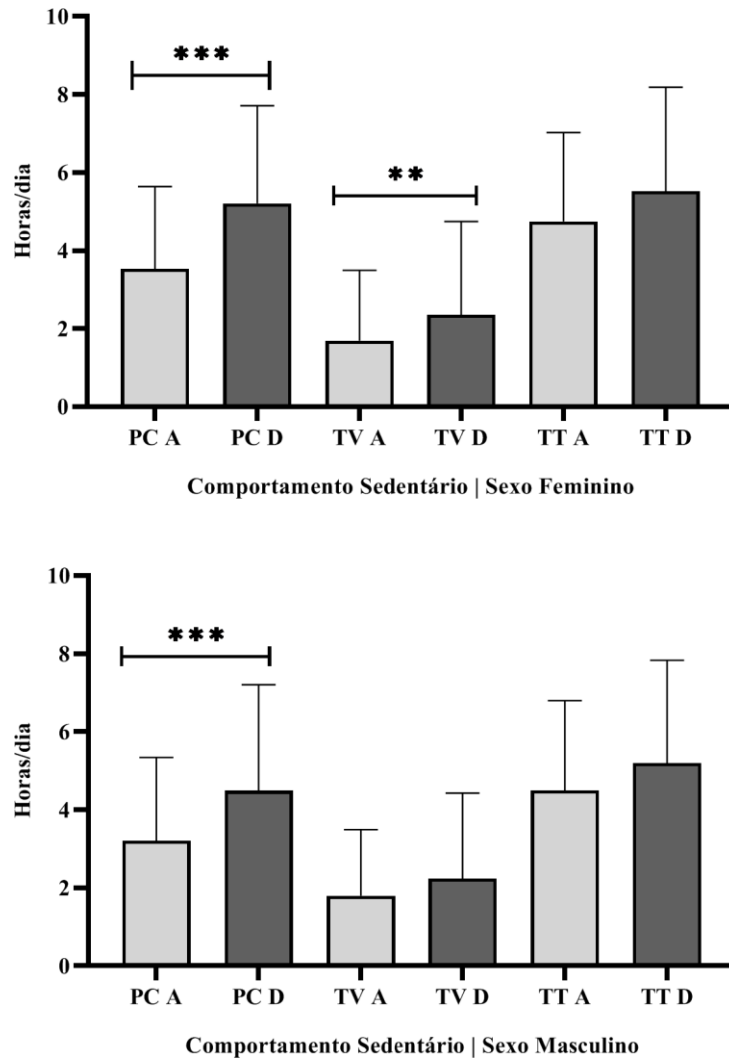
Source: Prepared by the authors. Caption: Net/Wall Sports: volleyball, tennis and padel; Invasion Sports: handball, football, futsal, basketball, American football and rugby; Brand/nature sports: athletics, swimming and orienteering; Combat sports: fighting and martial arts; Outdoor group aerobics; Individual outdoor aerobics: walking and running outdoors; Indoor aerobics: walking, running on a treadmill and spinning; Group classes: gymnastics and water aerobics; PE classes: physical education classes (mandatory curricular component).

It was found that 10.5% (n=29) of students abandoned physical activity during this period. The reasons cited as determining factors for stopping physical activities were: lack of motivation (93.1%; n=27); lack of space at home (37.9%; n=11); lack of own equipment (31%; n=9); and was infected by the coronavirus (3.4%; n=1). In relation to CS, an increase was observed in all forms analyzed. Before the period of social isolation, students reported taking CS for approximately 8h/day (or 480 min/day). During the pandemic, the number of hours per day for these behaviors was updated to 12 hours (or 720 min/day).

A significant difference was found when comparing PC use before and during the isolation period, in both sexes (female: from 3.5±2.1 to 5.2±2.5 h/day; male: 3.1±2.1 to 4.3±2.7

h/day; $p < 0.000$), being higher for girls (47.8%) when compared to boys (39.9%). In terms of TV time, a significant difference was found only in the female group ($p = 0.002$; increase of 39.3%). In the use of TT, the increase was 16.4% among girls and 15.4% among boys, which was not significant (Figure 3).

Figure 3 – Sedentary behavior of high school students, stratified by sex.



Source: Prepared by the authors. Caption: PC A: computer screen time (before); PC D: computer screen time (during); TV A: television screen time (before); TV D: television screen time (during); TT A: leisure screen time - social networks and games (before); TT D: leisure screen time - social networks and games (during). Multiple and paired comparisons: Friedman's test and Dunn's post hoc test; Significance level: $\alpha = 0.05$.

Discussion

As expected, during the pandemic period, students reduced the time spent practicing physical activities and days of weekly practice, and increased CS, following the global trend reported by Wilke *et al.* (2021), who found that self-reported physical activity decreased substantially following restrictions on public life associated with the COVID-19 pandemic. Systematic review studies with the general population, including children and adolescents, are also aligned with these results (Stockwell *et al.*, 2021; Caputo; Reichert, 2020).

The findings of this study, in relation to CA observed in schoolchildren, also follow those found in a multicenter study carried out in 14 countries, including Brazil, in which a negative variation in PAL was found, greater than 50% (Wilke *et al.*, 2021). Regarding the weekly time spent on physical activities, there was an average reduction of 144.3 min/week. Although the students in this study showed a drop in the time spent on physical activities, this reduction was smaller than that found in a study carried out in Shanghai, China, with more than 2000 children and adolescents, which found an average reduction of 435 min/week (Xiang; Zhang; Kuwahara, 2020). Another study observed that Spanish adolescents decreased their practice of physical activities by 91 min/day (Medrano *et al.*, 2021).

When analyzing the PAL between the sexes, it was found that the average decrease in min/week was similar between boys (145.6 min/week) and girls (140.8 min/week). However, both sexes managed to remain active for at least 3 days a week on average, which is in line with what the American College of Sports Medicine recommended in a publication at the beginning of the pandemic, advising 150 to 300 min/week of PA during the period of social isolation (ACSM, 2020). Even given the limitations of the period and changes in the format of classes (from in-person to online), which may have caused an overload in educational activities (Pandolfo; Azambuja; Dos Santos, 2022), students found ways to maintain practicing physical activities within recommended levels for health (Brazil, 2021).

One of the strategies adopted was Functional Training/CrossFit. When examining the responses about the type of physical activity carried out during the pandemic, this modality was the one that had the highest percentage increase among schoolchildren. This type of practice offers the possibility of being carried out in small spaces, including at home, and with adapted material, which may have influenced this choice.

On the other hand, invasion sports showed a significant drop. According to Brito *et al.* (2020), less space makes exercise more difficult and this information validates the results found for the behavior of invasion sports. The study carried out in Curitiba-PR, with 342 adolescents

aged 12 to 17, public school students and participants in school sports activities, demonstrated that only 27% could maintain physical activities at home, especially those guided by technical teachers (Brito *et al.*, 2020). The modalities of handball, basketball and futsal, classified within this group, require larger and standardized spaces for their practice. These factors are associated with the characteristic of being team sports, that is, they depend on the collaboration of a colleague and the opposition of an opponent for them to develop, a factor that was restricted, given the situation of isolation and distancing adopted during the period.

Corroborating these results, Yomoda and Kurita (2021), after analyzing 21 studies published in 2020, concluded that declines in physical activity are greater among children who participate in organized team sports and those with limited space. Another study (Schmidt *et al.*, 2020) showed that the closure of sports facilities during the COVID-19 pandemic in most countries resulted in decisive changes to young people's daily routines and their opportunities to be active, and Pietrobelli *et al.* (2020) reported that Italian children and adolescents who struggled with obesity reduced the time spent on sports activities by 2.30 ± 4.60 h/week ($p=0.003$).

The sports characterized as brand/adventure grouped in this study also presented results that deserve a careful look. Despite being sports characterized as individual (practitioners depend on themselves to achieve the goal), and capable of being carried out outdoors (which would not change as much during this period), they were activities that also showed a significant drop when compared to their practice before the pandemic. It is worth noting that the sports modalities of athletics and orienteering grouped into brand/adventure sports are worked on at the school where the study was developed, both in curricular Physical Education classes and in sports clubs offered after school, a fact that also occurs with invasion modalities.

Considering that the adolescents in this study spent most of the day in the school environment before the pandemic, a point that must be highlighted is the importance of school in the organization and practice of sports that showed the biggest drops during social isolation. According to Hall *et al.* (2020), much of the physical activity of children and adolescents is related to school life and, with the closure of schools, children's activity was largely restricted to the domestic environment.

The importance of school is evident when looking at the results from the period before distancing, in which PAL was more than 300 min/week. The educational institution investigated offers two periods of Physical Education classes per week, the subject being practical and mandatory, even though the educational guidelines in force in the country (Brazil,

2017) advise that only one period be offered per week. Physical Education as a curricular component presents itself as an important tool for increasing students' PAL, serving as a strategy for changing attitudes towards CS. Combined with this idea, offering sporting activities after school has the potential to minimize the negative effects of CS, as evidenced in the results related to the practice of invasion, branded and adventure sports.

Restricting sports opportunities, in addition to creating a barrier to physical activity, increased sedentary time during the pandemic period, justified by the greater time spent at home (Stockwell *et al.*, 2021). The CS of the students in this study increased by approximately 50%. The biggest increase occurred in the use of computers for studies, in both sexes. Girls started watching more television and the use of screens for leisure increased by approximately 15% for both sexes.

The increase in time in front of screens was an expected behavior during the period, as evidenced in several investigations. A study coordinated by the Oswaldo Cruz Foundation (Fiocruz) in partnership with the Federal Universities of Minas Gerais (UFMG) and the State Universities of Campinas (UNICAMP), with more than 9,000 Brazilian teenagers, investigated changes in routine and lifestyle. It was found that 70% started spending more than 4 hours a day in front of the computer, tablet or cell phone, in addition to online class time (Szwarcwald *et al.*, 2021). These numbers were not limited exclusively to Brazilians. Spanish teenagers (Medrano *et al.*, 2021), Italians (Pietrobelli *et al.*, 2020), Chinese (Xiang; Zhang; Kuwahara, 2020), Canadians, and South Koreans (Guan *et al.*, 2020) also suffered a similar impact.

The high percentage of computer use related to studies is understandable, taking into account the need to continue following classes that took place virtually during this period. It is noteworthy that the institution of this study adopted the virtual classes system the day after the decision to suspend face-to-face classes by the competent bodies, an aspect that was an exception among schools. This condition may have generated an overload of online activities related to the study.

Regarding TV time and use of TT, despite the increase, it was small compared to the use of the PC for studies. This is a worrying result that corroborates the importance of schools in the process of increasing NAF and combating CS. The fact that the school was closed took away the opportunity for teenagers to stay active and contributed greatly to the increase in CS. Approximately one third of the students in this study reported that in the period before the pandemic, Physical Education class was the only time per week in which they performed some type of physical practice. Of these, 50% stopped completely during isolation.

Among the reasons cited for abandoning physical activity during the pandemic period is “lack of motivation”. This obstacle may be associated with the fact that during Physical Education classes, adolescents tend to get involved with their peers, establishing social bonds to practice physical activity outside of school (Pandolfo *et al.*, 2019), which is not possible during the pandemic. For adolescents, social interactions and friendships significantly influence physical activity behaviors, a factor that has certainly been negatively impacted by COVID-19 (Hall *et al.*, 2020).

Another reason identified was the lack of space and equipment at home. Combined with this condition, the restriction of mobility with a reduction in leaving home, in addition to the impossibility of attending schools, squares and gyms, imposed a harsh routine on these adolescents (Hall *et al.*, 2020). In addition to the emotional consequences, these factors were decisive for the increase in screen time. It is important to highlight the negative effects on the general health of adolescents, with a reduction in physical activities and an increase in TT during the period of social isolation. In the short, medium and long term, this increased exposure to screens, associated with physical inactivity, has a direct implication in the development of chronic non-communicable diseases at older ages and even in mortality in the adult population (Hall *et al.*, 2020).

Final remarks

In conclusion, the impact of DiS caused by the COVID-19 pandemic was an increase in SC and a decrease in Ca in adolescents. Therefore, both the school and Physical Education classes must be consolidated as a space rich in opportunities for physical practices for children and adolescents. Such recognition contributes to meeting NAF recommendations for this audience.

The limitations of this study lie in the use of subjective and self-reported instruments; however, it was necessary given the period experienced at the time. Furthermore, remembering activities carried out in the previous period can generate memory bias, reflecting a perceived decline in PAL, instead of reflecting reality.

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