Revista de Psicología Clínica con Niños y Adolescentes
Vol. 12 nº. 2- mayo 2025 - pp 126-133
doi: 10.21134/rpcna.2025.12.2.6

www.revistapcna.com - ISSN 2340-8340

Revista de Psicología Clínica con Niños y Adolescentes

Is meeting 24-h Movement Guidelines associated with suicidal behavior in Brazilian adolescents? A cross-sectional study

Jean Carlos Parmigiani De Marco[1], Kwaku Oppong Asante[2, 3], Javier Brazo-Sayavera[4], Felipe Barreto Schuch[5], Andreia Pelegrini[1]
[1]*State University of Santa Catarina (Brazil)*
[2]*University of Ghana (Ghana)*
[3]*University of the Free State, Bloemfontein (South Africa)*
[4]*Universidad Pablo de Olavide (Spain)*
[5]*Federal University of Santa Maria (Brazil)*

Resumen

The absence of mental illness does not necessarily mean the presence of mental health or well-being. Especially after the COVID-19 pandemic, it is important to identify the risk and prevent the development of mental illness. The present study aimed to: a) characterize the levels of well-being and life satisfaction of adolescents; b) identify the risk of depression; c) analyze differences in the three dimensions of mental health considering sociodemographic characteristics (gender and level of education); and d) analyze predictors of life satisfaction and risk of depression, considering the sociodemographic characteristics and social-emotional skills. Participated in the study 3235 adolescents (50% female), aged between 11 and 20 years (*M*=14.47, *SD*=1.91). Participants attend public schools in the 3rd cycle of basic education (47.9%) and secondary education (52.1%), and responded to self-report measures. The results revealed that most adolescents (58.5%) have an average level of life satisfaction. However, 51.1% of participants have a low level of well-being and 19.6% are at risk of depression. All the social-emotional skills included in the models proved to be significant predictors of life satisfaction and lower risk of depression, especially optimism (besides emotional control, stress resistance and sociability). The results reinforce the existence of a double continuum of mental health and mental illness. The results also support the relevance of implementing school-based interventions to promote social-emotional skills that help adolescents deal with the challenges of a changing world, and to prevent depression. From a public health perspective, it is essential to implement universal prevention programs that are part of the paradigm of health-promoting schools.

Keywords: values: well-being; life satisfaction; depression; social-emotional skills; adolescents.

Abstract

Satisfacción con la Vida y Riesgo de Depresión: El papel de las habilidades socioemocionales de los adolescentes. La ausencia de enfermedad mental no significa necesariamente la presencia de salud mental o bienestar. Especialmente después de la pandemia de COVID-19, es importante identificar el riesgo y prevenir el desarrollo de enfermedades mentales. El presente estudio tuvo como objetivos: a) caracterizar los niveles de bienestar y satedades comprendidas entre 11 y 20 años (*M*=14,47, *DT*=1,91). Los participantes asisten a escuelas públicas de 3er ciclo de enseñanza básica (4ionales incluidas en loemocional, resistencia al estrés y sociabilidad). Los resultados refuerzan la existencia de un doble continuo de salud mental y enfermedad mental. Los resultados también apoyan la relevancia de implementar intervenciones escolares para promover habilidades socioemocionales que ayuden a los adolescentes a afrontar los retos de un mundo cambiante, y para prevenir la depresión. Desde la perspectiva de la salud pública, es esencial implementar programas de prevención universal que formen parte del paradigma de las escuelas promotoras de la salud.

Palabras clave; bienestar; satisfacción con la vida; depresión; habilidades socioemocionales; adolescentes.

Autor de correspondencia / *Corresponding author*: Andreia Pelegrini (andreia.pelegrini@udesc.br)

Citar como / Cite as: De Marco, J.C., Asante, K.O., Brazo-Sayavera, J., Schuch, F.P., Pelegrini, A. (2025). Is meeting 24-h Movement Guidelines associated with suicidal behavior in Brazilian adolescents? A cross-sectional study. *Revista de Psicología Clínica con Niños y Adolescentes*, 12(2), 126-133. doi: 10.21134/rpcna.2025.12.2.6

Recibido / *Received*: August 30, 2024
Aceptado / *Accepted*: December 14, 2024

Highlights

— Only 4.3 % of adolescents met all 24-h Movement Guidelines, while 25.8 % met none.
— Adherence to at least two movement guidelines reduced the odds of suicide ideation, planning, and attempted suicide.
— Adolescents who followed all movement guidelines were less likely to have suicidal ideation compared to those who followed none.

Puntos clave

— Solo el 4,3% de los adolescentes cumplió con todas las pautas de movimiento de 24 horas, mientras que el 25,8 % no cumplió ninguna.
— Cumplir al menos dos pautas de movimiento redujo las probabilidades de ideación suicida, planificación y tentativa de suicidio.
— Los adolescentes que siguieron todas las pautas de movimiento tuvieron menos probabilidades de ideación suicida en comparación con aquellos que no cumplieron ninguna.

Suicide, a severe public health issue, causes more than 700,000 deaths annually (1.3 % of the global total) and is the fourth leading cause of death among individuals aged 15 to 29 years (World Health Organization [WHO], 2021). In the Americas, suicide mortality rates have increased, contrasting with the decline observed in other WHO regions, underscoring the urgent need to prioritize its prevention as a public health concern in this region (WHO, 2021). In Brazil, from 2010 to 2021, suicide rates increased by 42 %, with the most significant rise occurring between 2020 and 2021 (11.4 %) (Brazil, 2024). During this period, the southern region of Brazil recorded a rate of 11.2 suicides per 100,000 inhabitants (Brazil, 2024), coinciding with the COVID-19 pandemic, which contributed to the global rise in suicidal behavior (Kim et al., 2024). Notably, the highest proportion of suicides relative to total deaths in Brazil was observed among adolescents (6.9 %), with rates of 9.3 and 4.5 per 100,000 inhabitants among male and female adolescents, respectively (Brazil, 2024).

Suicidal behaviors are widely recognized as complex and multifaceted phenomena involving a network of individual and collective determinants, including biological, psychological, social, cultural, and economic factors (Brazil, 2024; WHO, 2021). These behaviors encompass three interrelated and often sequential components: ideation (thoughts about suicidal acts), planning (consideration of methods for execution), and attempts (concrete actions intended to end one's life) (Franklin et al., 2017).

Although there are several factors that can influence suicidal behaviors, the adoption of a healthy lifestyle has been identified as one of the main correlates (Fabiano et al., 2024; Geoffroy et al., 2021; Gong et al., 2020). Specifically, the literature has pointed out that daily behavioral factors, such as physical activity (Fabiano et al., 2024), control of sedentary behavior (Silva et al., 2020) and better duration and quality of sleep (Geoffroy et al., 2021; Gong et al., 2020) may contribute to reducing the likelihood of manifestation of these suicidal behaviors. According to 24-h movement guidelines, it is recommended that young people aged 5–17 years spend ≥ 60 min per day in moderate-to-vigorous physical activity, ≤ 2 h per day of recreational screen time, and sleep 9–11 h per day (children aged 5–13) or 8–10 h per day (adolescents aged 14–17) (Tremblay et al., 2016). These guidelines propose that physical activity, sedentary behavior, and sleep duration be addressed as continuous elements over time, rather than evaluating each component's impact individually on health outcomes. This approach considers the modification of one component, which, in turn, will influence the duration of the others (Ross et al., 2020; Tremblay et al., 2016).

Previous studies that have examined the relationship between compliance with 24-h movement guidelines and suicidal behaviors in adolescents have been reported with data from the United States (García-Hermoso et al., 2022; Liu et al., 2022; López-Gil et al., 2024) and Canada (Sampasa-Kanyinga et al., 2020). Among these studies, only two examined the associations between 24-h movement guidelines and the three components (ideation, planning, and attempt) of suicidal behaviors (Liu et al., 2022; López-Gil et al., 2024). For example, the study by Liu et al. (2022) showed that adolescents not meeting all the recommendations of the 24-h movement guidelines were significantly associated with an increased risk of suicidal ideation and planning compared with adolescents who meet all the recommendations. Similarly, adolescents in the United States who met all the three recommendations were associated with lower odds of suicidal ideation, suicide planning, and attempted suicide; and this associations appear slightly stronger among female adolescents (López-Gil et al., 2024). These studies show that meeting all three recommendations is associated with lower odds of suicidal ideation.

In Brazil, research examining the relationship between 24-h movement guidelines and suicidal behavior among adolescents is sparse. While studies in developed countries suggest adherence to these guidelines reduces the likelihood of suicidal behaviors in adolescents, these findings may not apply to the Brazilian context due to sociocultural and economic differences. Considering that social norms, behavioral expectations, inequalities, and economic difficulties can negatively affect adolescents' general living conditions (Brazil, 2024; Kim et al., 2024; Tapia-Serrano et al., 2022; WHO, 2021). To address this gap, the present study aimed to investigate the independent and combined association between adherence to 24-h movement guidelines and suicidality among Brazilian adolescents. The hypothesis was that adherence to all three guidelines would be associated with a lower likelihood of suicidal behaviors. The findings of this study are intended to inform the development of preventive measures and interventions for this public health issue.

Methods

Participants

The total sample of the present study consisted of 1,026 school-aged adolescents. Of these, seven were removed due to age over 19 years, 31 due to missing data on movement and 24-h movement guidelines, and another four due to incomplete completion of the self-esteem questionnaire, resulting in a final sample of 983 adolescents.

Study design

This is an observational, epidemiological, school-based study with a cross-sectional design. Developed according to the Reporting of Observational Studies in Epidemiology (STROBE) criteria. (Vandenbroucke et al., 2014). Ethical approval was obtained from the Human Research Ethics Committee of State University of Santa Catarina (protocol No. 2,172,699) Written informed consent from parents/guardians and assent from adolescents under 18 years old were obtained.

Instruments

Suicidal behaviors

Three domains of suicidal behavior, namely suicide ideation, planning, and attempt, were considered as the outcome variables for this study. The three domains were each assessed using a single-item question. Suicide ideation was measured with: "*during the past 12 months, have you, at any point, seriously thought about committing suicide (killing yourself)?*" (scored Yes=1; No=0), suicide planning with: "*during the past 12 months, have you ever planned how to commit suicide?*" (scored Yes=1; No=0) and suicide attempt with: "*during the past 12 months, how many times have you actually attempted suicide?*" (scored as "0", "1", "2 or 3", "4 or 5", and "6 or more times"). We subsequently dichotomized this variable by assigning "0" to no attempt and "1" to one or more attempts. These items were evaluated using the Youth Risk Behavior Survey – YRBSS in Brazil, presenting adequate agreement values measured using Cohen's κ-reliability coefficients (> 0.7) for each of the questions (Guedes & Lopes, 2010).

24-h movement guidelines

Physical activity. It was measured using the Brazilian version of the short International Physical Activity Questionnaire (IPAQ), which presented reproducibility values based on Spearman's correlation coefficient (R_s) ranging from 0.49 to 0.70 among girls and 0.56 to 0.83 among boys. In terms of validity, the instrument showed modest correlations with data from the 24-hour recall, with coefficients ranging from 0.09 to 0.51 (Guedes et al., 2005). The scale consists of 7 items measuring participation in physical activity in the last 7 days, measured at different times of the day. To assess physical activity index, the participation of a list of activities, the physical activity performed during physical education lessons, in school holidays, during the school break, at lunchtime, after school, in the evening and on non-school days was asked. Adolescents aged 14 to 17 years old were considered physically active if they practiced moderate to vigorous physical activity on average 60 minutes per day during the week. For those aged 18 to 19, physically active adolescents were considered those engaging in at least 150 minutes of moderate to vigorous physical activity per week (Ross et al., 2020; Tremblay et al., 2016). Participants whose physical activity levels were lower than the aforementioned criteria were classified as insufficiently active.

Sedentary behavior. It was evaluated based on recreational screen time, considering the time spent in front of electronic devices (television, computer, and video games, separately) on weekdays and weekends, presenting adequate agreement values measured from Cohen's κ-reliability coefficients (> 0.7), with its validity performed in comparison with accelerometry (Rey-López et al., 2012). An average recreational screen time was obtained for each screen-based behavior on a ratio of 5:2 with the formula: [(screen time on weekdays * 5) + (screen time on weekends * 2) /7]. The average recreational screen time was calculated by summing up the different daily screen-based behaviors. In line with 24-h movement guidelines for adolescents, participants were classified in two main groups: those meeting screen time recommendations (≤ 2 h/day) and those not meeting the guideline (> 2h/day). For those aged 18 and 19, compliance with the guidelines was considered if they spent ≤ 3 h/day on recreational screen time (Ross et al., 2020; Tremblay et al., 2016).

Sleep duration. It was analyzed considering bedtime and wake time on weekdays and weekends (Louzada & Menna-Barreto, 2004). An average sleep duration time was obtained in a ratio of 5:2 with the formula: ([sleep duration on weekdays * 5] + [sleep duration on weekends * 2] /7). Based on the 24-h movement guidelines for adolescents, participants were classified into 2 groups: those meeting sleep duration recommendations of 8-10 hours per day for adolescents aged 14-17 years or 7-9 hours for adolescents aged 18 years and (Ross et al., 2020; Tremblay et al., 2016). Participants whose sleep duration were outside this stated range were considered as having inadequate sleep.

Covariates

Sociodemographic variables were self-reported from the survey, including age of participants (in years), sex (male/female) and self-esteem. This last variable was measured using the Rosenberg Self-Esteem Scale (Rosenberg, 1965), validated for adolescents (Cronbach's α = 0.68, ICC = 0.70) (Avanci et al., 2007). The items are rated on a 4-point Likert scale, ranging from strongly disagree to strongly agree. Scores ranged from 10 to 40. Higher scores indicated elevated levels of self-esteem.

Procedure

The study was conducted between 2017 and 2018 in Florianópolis, Santa Catarina, Brazil. The target population consisted of adolescents of both sexes, aged between 14 and 19 years old, who attended high school in public schools in the municipality. According to data from the State Department of Education, there were 10,119 adolescents enrolled in high school in public schools in Florianópolis, who were considered eligible for the study. To determine a representative sample, a confidence level of 95%, a margin of error of 4%, an estimated prevalence of 50% for unknown outcome and a design effect of 1.5 were adopted (Luiz & Magnanini, 2000). An additional 10% was added to the sample number to mitigate potential sample losses, reaching a minimum sample of 936 adolescents.

To ensure that the sample better represented the city's reality, the five regions proposed by the Municipal Health Department (Continent, Center, East, North, and South) were considered. Subsequently, the school with the highest number of students enrolled in high school in each region was invited to participate in the study. All adolescents present on the day of the assessment who agreed to participate voluntarily were considered eligible to participate in the study. The inclusion criteria were being between 14 and 19 years old, being enrolled in high school at one of the selected schools, willing to participate

voluntarily and not having any physical or psychological disorders that would prevent them from completing the questionnaire or taking the physical tests. The participants completed the questionnaires anonymously and deposited them in a box provided by the researchers in the classrooms.

Statistical analysis

Descriptive data were reported as frequencies and percentages. Participants were classified into one of the following groups based on the 24-h movement guidelines: not meeting recommendations, meeting only with physical activity, meeting only with sedentary behavior, meeting only with sleep duration, meeting only with physical activity + sedentary behavior, meeting only with physical activity + sleep duration, meeting only with sedentary behavior + sleep duration, and meeting all three recommendations. We conducted a logistic regression to examine the association between 24-h movement guidelines and suicidal behavior. To select the adjustment variables, the minimum number of 10 individuals exposed to the outcome (presence of suicidal behavior) was considered for each continuous variable or each category of categorical variables. Therefore, in all our analyses, we adjust for gender, age and self-esteem. The results of the logistic regression were reported as odds ratios with 95% Confidence Intervals (CI). All analyses were carried out using IBM SPSS Statistics 20.0. The level of significance was set at $p < 0.05$..

Results

Participants had a mean age of 16.5 years (*SD* = 1.1) and a self-esteem questionnaire score of 25.52 (*SD* = 2.79), with the majority of the sample consisting of male adolescents (*n* = 506; 51.5 %). The 12-month prevalent estimate of 22.0 %, 12.8 %, and 7.6 % was found for suicidal ideation, planning, and attempt respectively (Table 1). Among the 75 individuals who presented suicidal behavior, the exploratory analysis revealed that 80 % expressed ideation and planning before trying. A proportion of 10.7 % of these adolescents progressed directly from ideation to attempted suicide, while only 2.7 % planned and carried out attempted suicide without a prior ideation phase. Surprisingly, 6.7 % of adolescents in this group showed attempted suicide without previous signs of ideation or planning (data not presented in table).

Figure 1 shows the prevalence of adolescents who met each of the 24-h movement guidelines and in combination. Overall, the 17.2 % met sleep duration guidelines, whereas 15.7 % and 9.5 % met physical activity and screen time guidelines respectively. Figure 1 also shows that only 4.3 % met all the three recommendations, while over a quarter (25.8 %) did not meet any of the recommendations.

The association between 24-h movement guidelines and each of the indices of suicidal behavior are presented in Table 2. Physical activity (*OR* = 0.70, 95 % CI: 0.49 – 0.98), sleep durations (*OR* = 0.63, 95 % CI: 0.46 – 0.88), combination of physical activity and sedentary behavior (*OR* = 0.47, 95 % CI: 0.25 – 0.90), and the combination of physical activity and sleep duration (*OR* = 0.61, 95 % CI: 0.39 – 0.98) were all associated with suicidal ideation. Meeting of the sleep duration guidelines only was associated with both suicidal planning (*OR* = 0.66, 95 % CI: 0.44 – 0.98) and attempt (*OR* = 0.60, 95 % CI: 0.36 – 0.99).

Table 1. General characteristics and suicidal behaviors of adolescents

	$\bar{x}$, n	DT, %
Age (years)	16.5	1.1
Self-esteem (score)	25.5	2.8
Sex		
Male	506	51.5
Female	477	48.5
Suicidal Ideation		
Yes	216	22.0
No	767	78.0
Suicide Planning		
Yes	126	12.8
No	857	87.2
Suicide Attempt		
Yes	75	7.6
No	908	92.4

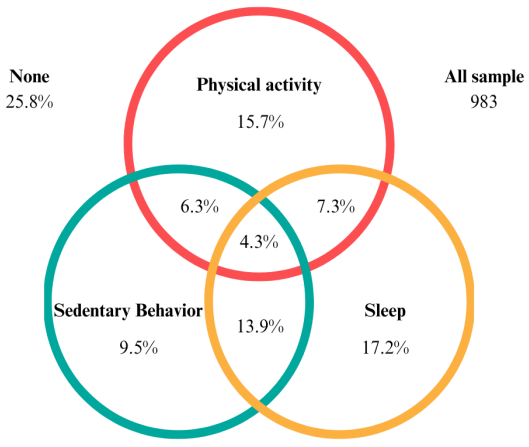
Note. $\bar{x}$ *= mean; DT = standard deviation.*

Table 2. Isolated and combined associations of adherence to 24-hour movement recommendations with suicidal behaviors among adolescents from southern Brazil

	Suicidal ideation *OR* (95 % CI)	Suicide planning *OR* (95 % CI)	Attempted suicide *OR* (95 % CI)
Physical activity	0.70 (0.49 – 0.98)*	0.83 (0.45 – 1.05)	0.83 (0.49 – 1.41)
Sedentary Behavior	0.79 (0.55 – 1.14)	0.85 (0.55 – 1.33)	0.80 (0.46 – 1.39)
Sleep	0.63 (0.46 – 0.88)*	0.66 (0.44 – 0.98)*	0.60 (0.36 – 0.99)*
PA+SB	0.47 (0.25 – 0.90)*	0.57 (0.27 – 1.24)	1.40 (0.66 – 2.96)
PA+Sleep	0.61 (0.39 – 0.98)*	0.57 (0.31 – 1.03)	0.52 (0.23 – 1.17)
SB+Sleep	0.66 (0.39 – 1.13)	0.65 (0.33 – 1.28)	0.57 (0.24 – 1.36)

*Note. OR = Odds ratio; CI = confidence interval; PA = Physical activity; SB = Sedentary behavior. Each line refers to an isolated model adjusted for gender, age and self-esteem. *p < 0.05*

Figure 1. Diagram showing the proportion of participants meeting no guidelines; physical activity, recreational; screen time, and sleep duration; and combinations of recommendations



The results of the associations between simultaneous adherence to the 24-h movement guidelines and suicidal behaviors are presented in Table 3. Participants who met all the three recommendations were associated with reduced odds of only suicidal ideation (*OR* = 0.33, 95% CI: 0.12 – 0.91). However, those who met two recommendations of the 24-h movement guidelines were associated with reduced odds of all the three indices of suicidal behaviors, that is suicidal ideation (*OR* = 0.50, 95% CI: 0.32 – 0.78), planning (*OR* = 0.57, 95% CI: 0.33 – 0.98) and attempt (*OR* = 0.46, 95% CI: 0.23 – 0.92).

Table 3. Association of adherence to 24-hour movement behavior guidelines with suicidal behaviors in adolescents from a city in southern Brazil

	Suicidal ideation *OR* (95 % CI)	Suicide planning *OR* (95 % CI)	Attempted suicide *OR* (95 % CI)
Combined analysis			
No recommendation	Reference	Reference	Reference
One recommendation	0.72 (0.50 – 1.04)	0.72 (0.46 – 1.12)	0.66 (0.38 – 1.14)
Two recommendations	0.50 (0.32 – 0.78)*	0.57 (0.33 – 0.98)*	0.46 (0.23 – 0.92)*
Three recommendations	0.33 (0.12 – 0.91)*	0.24 (0.05 – 1.04)	0.67 (0.19 – 2.38)

*Note. OR = Odds ratio; CI = confidence interval. The model was adjusted by age, sex, self-esteem. *p < 0.05*

Discussion

The main objective of this study was to examine the independent and combined associations between the 24-h movement guidelines and suicidal behavior, and to analyze whether adherence to these guidelines would decrease the likelihood of suicidal behavior compared to those who did not meet the three recommendations in Brazilian school-going adolescents. The main findings of the study revealed that: 1) meeting only the sleep duration guidelines was associated with reduced odds of suicidal ideation, planning, and attempt, while meeting the physical activity guidelines was associated with reduced odds of only suicidal ideation; 2) participants who met all three recommendations were associated with reduced odds of only suicidal ideation; and 3) complying with at least two movement recommendations was associated with reduced chances of exhibiting any suicidal behavior.

Our results showed that meeting the three 24-h movement guidelines was associated with reduced odds of suicidal ideation, as in previous studies (García-Hermoso et al., 2022; Liu et al., 2022; López-Gil et al., 2024; Sampasa-Kanyinga et al., 2020). For instance, Sampasa-Kanyinga et al. (2020) found that adolescents aged 15 and older who adhered to all three guidelines had lower odds of suicidal ideation. These findings highlight the importance of developing interventions to promote and adopt these guidelines, as they have the potential to reduce the risk of suicidality during adolescence.

Although our study did not find that adherence to all three 24-h movement guidelines reduces the chances of planning and attempting suicide among adolescents, unlike previous research (López-Gil et al., 2024; Sampasa-Kanyinga et al., 2020), we found that adherence to at least two guidelines helps reduce these suicidal behaviors. While greater reductions would ideally be expected when meeting all three guidelines, these results demonstrate the benefits of multiple healthy behaviors in preventing suicidal behaviors. When considering the reductions in the likelihood of planning and attempting suicide among adolescents in North America (Canada and the United States) who follow all 24-h movement guidelines (López-Gil et al., 2024; Sampasa-Kanyinga et al., 2020), the absence of these associations among Brazilian adolescents may be attributed to sociocultural and economic differences between the countries. Both Canada and the United States have higher Human Development Index (HDI), and lower social inequality compared to Brazil (UNDP, 2024; World Bank Group, 2024), which results in better overall living and health conditions for the population (Barreto, 2017; Tapia-Serrano et al., 2022). Furthermore, the development of public policies and projects aimed at promoting a healthy lifestyle in these countries may contribute to a cultural habit of health care (Aubert et al., 2022), which could explain the higher prevalence of adherence to 24-h movement guidelines among adolescents in North America compared to South America (Tapia-Serrano et al., 2022).

In this context, the reduction in suicidal behaviors associated with adherence to movement guidelines could be attributed to the cumulative effects of the healthy lifestyle choices adopted by adolescents. For example, sleep was the 24-h behavior that contributed most individually to reducing suicidal behaviors in the present study. A dose-response relationship between sleep duration and the propensity for suicidal behavior has already been demonstrated. These findings corroborate previous investigations that demonstrate a dose-response relationship between sleep duration and the propensity for suicidal behaviors (Chiu et al., 2018), highlighting that adolescents with inadequate sleep disorders are more susceptible to such behaviors (Liu et al., 2019).

It is globally acknowledged that sleep is important for both mental and physical health, and the lack of it has been linked to negative psychosocial challenges including depression and mood disorders (Lovato & Gradisar, 2014). A recent systematic review has revealed that inadequate or shorter sleep duration has a negative effect on a range of mood problems in adolescents (Short et al., 2020). Furthermore, it has also been asserted that sleep deprivation can lead to induced hypo-frontality, as the frontal region of the brain is vulnerable to such effects, resulting in fatigue and impairment of executive functions (Perlis et al., 2016). Such wear and tear are amplified by hyper-excitation experienced during wakefulness (Fernandes et al., 2024). This condition, in turn, triggers a cascade of negative effects, including mood deterioration and increased affective reactivity (Fernandes et al., 2024; Hamilton et al., 2023; Perlis et al., 2016). The interaction of these elements may contribute to the propensity for suicidal behaviors.

Although meeting physical activity recommendations was only associated with reductions in suicidal ideation, maintaining physical activity levels in turn may contribute to the improvement of mental health, reflected in enhanced psychological well-being, life satisfaction, and self-image (Rodriguez-Ayllon et al., 2019). Additionally, regular physical activity has been shown to be associated with fewer depressive symptoms (Kandola et al., 2019; Recchia et al., 2023; Rodriguez-Ayllon et al., 2019), stress, negative affect, psychological distress (Rodriguez-Ayllon et al., 2019) and emotional impulsivity (Fabiano et al., 2024), which are all known to be related with a higher risk of suicidal behaviors when present at inadequate levels (Shain et al., 2016).

The psychological contributions resulting from physical activity manifest in different dimensions and are influenced by social aspects that enhance interpersonal relationships. Participation in collective activities provides a conducive context for strengthening social ties, leading to better interaction and, consequently, promoting the development of self-esteem and a sense of belonging (Zuckerman et al., 2021). In addition to socio-affective nuances, physical activity also plays a crucial role in physiological aspects, contributing significantly to the promotion of mental health. Through the practice of physical exercise, it is possible to promote improvements in neuroplasticity in regions affected by depression, in addition to contributing to neuroendocrine aspects that help to neutralize depressive effects (Kandola et al., 2019). Furthermore, evidence indicates that the antidepressant effect of physical exercise in depressed adults may be related to the improvement in circulating levels of kynurenine, interleukin-6, and brain-derived neurotrophic factor (da Cunha et al., 2023). This complex interplay between social and physiological aspects highlights the multifaceted nature of the psychological benefits derived from regular physical activity.

Sedentary behavior, despite not showing isolated associations with suicidal behavior, when combined with physical activity was responsible for the greatest reductions in the chances of suicidal ideation. Sedentary behavior is inherently linked to a variety of mental disorders, notably depression and anxiety (Huang et al., 2020; Johnstad, 2023; Twenge & Campbell, 2018; Viner et al., 2019). These disorders, in turn, increase the possibilities of triggering suicidal behaviors (Shain et al., 2016).

In a contemporary scenario where young people are incessantly exposed to media (Viner et al., 2019), this exposure emerges as a relevant factor associated with suicide in the short and long term, especially in cases of high and early involvement in social networks or when subjected to cyberbullying situations (Coyne et al., 2021). Additionally, it is noted that those who dedicate considerable time to screens face significant challenges in emotional regulation and forming friendships (Twenge & Campbell, 2018). This deficiency in the ability to establish social connections can result in greater loneliness and lack of a support network, factors inherently associated with suicidal behaviors (Shain et al., 2016). These insights underscore the urgency of understanding and addressing the impacts of sedentary behavior and excessive media exposure, especially among young people, in mitigating risks associated with mental health and suicide.

The present study has some limitations. First, the cross-sectional design prevents the establishment of causal relationships between 24-h behaviors and occurrences of suicidal behaviors. This restricts the ability to infer causality, indicating that future studies should employ a longitudinal design to explore the directionality of this relationship. Second, the measures used to assess the key variables were valid and reliable but based on self-reports. This may have led to either an underestimation or overestimation of the results. Finally, future studies should also evaluate the role of other movement behaviors, such as sleep quality, sleep continuity and the purpose of sedentary behavior in suicidal behavior among adolescents. Notwithstanding these limitations, the present study also has some strengths that should be highlighted. This is one of the first studies within the Brazilian context to have examined the association between meeting all the 24-h movement guidelines and suicidal behavior among adolescents. Additionally, the inclusion of age, sex, and self-esteem as covariates in the analysis increased the strength of the study.

Conclusion

In conclusion, this study suggests that adherence to the 24-h movement guidelines may play a relevant role in preventing suicidal behavior among adolescents in Brazil. These findings indicate that meeting at least two of the 24-h movement guidelines reduces the odds of adolescents engaging in suicidal behavior. Given the low prevalence of adolescents meeting all three movement recommendations, it is necessary to develop and implement targeted efforts and actions to promote the adoption of these guidelines. Public health initiatives, particularly school-based educational programs and extracurricular activities are crucial to promote healthy lifestyles among young people. These initiatives have the potential to significantly reduce the risk of suicide during adolescence, promoting an improvement in the overall health of the population.

Funding

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001. And by the Fundação de Âmparo à Pesquisa e Inovação de Santa Catarina (FAPESC, grant number 2023TR000330).

Conflict of interest

The authors of this paper state that there is no conflict of interest.

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