

24-Hour Movement Behaviors of Grade 9 Costa Rican Students: A Pilot Study

Elisa B. Sosa Nicora, Vivienne A. Temple

School of Exercise Science, Physical and Health Education, University of Victoria, British Columbia, Canada

Email: vtemple@uvic.ca

How to cite this paper: Sosa Nicora, E. B., & Temple, V. A. (2025). 24-Hour Movement Behaviors of Grade 9 Costa Rican Students: A Pilot Study. *Advances in Physical Education*, 15, 341-351.

<https://doi.org/10.4236/ape.2025.153023>

Received: July 12, 2025

Accepted: July 28, 2025

Published: July 31, 2025

Copyright © 2025 by author(s) and Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Meeting individual 24-hour movement behavior guidelines of physical activity, sedentary behavior, and sleep is independently and collectively associated with positive physical, psychosocial, and mental health outcomes. The aim of this pilot study was to examine the feasibility of the study and to provide preliminary evidence of the 24-hour movement behaviors of Grade 9 Costa Rican students. Cross-sectional data were collected using the physical activity sub-section of the Global School-Based Student Health Survey with $n = 118$ students (male = 51) in the Guápiles region of Costa Rica. The proportion of students meeting individual guidelines was: MVPA = 11.0%, strength exercises = 40.7%, sedentary time = 32.2%, and sleep = 39.8%. There were no gender-based differences based on chi-squared analyses of the proportion of males and females meeting each health guideline. One student met all four guidelines examined, and 37 students (31.4% of the sample) did not meet any of the guidelines. Our findings demonstrated that many Grade 9 students in the Guápiles region were not meeting individual 24-hour movement behaviors or combinations of those movement guidelines. These findings demonstrate a need to concurrently examine the 24-hour movement behaviors of Costa Rican youth. Additionally, assessing health and academic outcomes associated with meeting individual and integrated 24-hour movement behavior guidelines is needed.

Keywords

Latin America, Physical Activity, Adolescence, Sleep, Sedentary Behavior

1. Introduction

Interest and research on a combination of physical activity, sedentary behavior, and sleep behavior guidelines has swelled over the past decade (de Lannoy et al., 2023; Wilhite et al., 2023). These combined guidelines have been termed the “24-

hour movement guidelines” (Tremblay et al., 2016) or “movement guidelines” (Wilhite et al., 2023) and were initially published for children and youth in 2016 (Tremblay et al., 2016). The intensified interest is an outgrowth of research showing that meeting a guideline is independently associated with positive physical, psychosocial, and mental health outcomes (Bang et al., 2020; Chaput et al., 2020; Faulkner et al., 2020; Janssen et al., 2017) and compromising any of the movement behaviors has negative health consequences (Wilhite et al., 2023). Further, interest has grown because meeting combinations of guideline recommendations is associated with better outcomes among children and youth (Bang et al., 2020; Bao et al., 2024; de Lannoy et al., 2023; Rollo et al., 2020; Sampasa-Kanyinga et al., 2017; Wilhite et al., 2023). However, Sampasa-Kanyinga and colleagues (2017) found that different countries had significantly different associations between health-related quality of life and whether children met the 24-hour movement guidelines. Children from higher-income countries had a more positive health-related quality of life when they met all the guidelines, whereas children from lower-income countries did not. This finding highlights the importance of considering each country as social and cultural contexts differ.

Latin America has historically been under-represented in physical activity surveillance data, especially for youth (Aguilar-Farias et al., 2018). Although there is some interest in examining the 24-hour movement behaviors in this world region (Ferrari et al., 2022), these behaviors have not been concurrently examined in Costa Rican youth. In terms of the individual movement behaviors, Guthold and colleagues’ synthesis of cross-sectional survey data involving 1.6 million adolescents between the ages of 11 and 17 years from 146 countries and jurisdictions revealed that 82.0% of students in Costa Rica were insufficiently active (defined at <60 minutes of MVPA/day or being active < 60 minutes on 5 days/week) (Guthold et al., 2020). Further, Aguilar-Farias et al. (2018) found that the median number of active days, defined as ≥ 60 minutes of MVPA per day among 2601 Costa Rican youth (mean age 14.3 years), was 2. These authors also found that, on average, 18.5% of students (24.7% of males and 12.1% of females) were physically active on 7 days per week. Additionally, Costa Rica had the 2nd highest relative gender-based difference of the 26 Latin American countries included in Aguilar-Farias et al.’s study (Aguilar-Farias et al., 2018).

Sedentary behavior levels of Costa Rican youth were recently reported by da Silva and colleagues (2024). These authors presented a national surveillance data set that used the Global School-Based Student Health Survey (GSHS) in 2009. The criteria for sedentary behavior were the same as in the present study, that is, ≥ 3 hours per day (when not in school or doing homework) spent sitting and watching television, playing computer games, talking with friends, using their mobile phone, or doing other sitting activities. Overall, the prevalence of sedentary behavior was 43.6% and females were significantly more sedentary than males (46.3% and 40.9%, respectively).

Data on sleep and muscular strength exercise participation of Costa Rican youth

are limited. However, in national surveys, engaging in regular strength activities among those aged 15 - 35 years (no further stratification provided) was 4.5% in 2013 (Ministerio de Cultura Y Juventud, 2013) and 6.6% in 2018 (Ministerio de Cultura Y Juventud, 2018). Further, Costa Rica's Ministry of Health (Ministerio de Salud & Caravaca Rodríguez, 2019) reported that the proportion of students in grades 8 - 10 getting 8 or more hours of sleep on week and weekend nights was 20.9% and 55.9%, respectively.

The reasons to conduct a pilot study include assessing the likely success of proposed recruitment approaches, identifying potential logistical problems, further developing a research question and plan, and convincing funding bodies and other stakeholders that the research study is worth supporting (van Teijlingen & Hundley, 2002). Collecting preliminary data can also help to establish whether a subsequent intervention might bring about benefits to participants. Consistent with the reasons why pilot studies are conducted, we examined feasibility, our ability to recruit participants, and collected data to provide preliminary evidence of the 24-hour movement behaviors of Grade 9 Costa Rican students. The following research questions were asked: 1) How many days per week did students accrue 60 minutes or more of MVPA and undertake muscle strengthening exercises? 2) How many hours per day did students spend in sedentary activities? 3) How many hours of sleep did students get per night? 4) What proportion of students met the guidelines related to MVPA, strength, sedentary, and sleep behaviors? 5) Did the proportion of students meeting guidelines differ by gender?

2. Method

2.1. Design and Ethics Approval

This descriptive cross-sectional pilot study was approved by the University of Victoria Human Research Ethics Board (Protocol Number 24-0078), the Vice Minister of Costa Rica's Ministry of Public Education Academic Office, the Guápiles' Education Directorate and Regional Physical Education Advisor, each school director, and physical education teachers of participating classes. Students' parents or guardians provided informed consent for the student to participate, and students provided written assent.

2.2. Sampling Frame and Participants

This study took place in School Circuit 01 of the Guápiles' Regional Education Directorate, Pococí, Limón, Costa Rica in 2024. Three public and two private high schools in a medium-sized urban area were invited to participate. Those five schools were clustered geographically and served more than half of the high school student population in Guápiles. Of the 646 eligible Grade 9 students, the final sample was $N = 118$. The recruitment rates were 17% in the public and 30% in the private schools. Students' average age was 14.7 years ($SD = 0.6$), and 43% were male. **Table 1** displays school-level gender, age, and type of school descriptive statistics.

Table 1. Student age, gender, and school type for each participating school.

	School 1	School 2	School 3	School 4	School 5
Number of students	59	19	22	6	12
Male	18	11	12	3	7
Female	41	8	10	3	5
Type of school	Public	Public	Public	Private	Private
Mean age in years (SD)	14.7 (0.7)	14.5 (0.5)	14.6 (0.5)	15.3 (1.0)	14.5 (0.5)

2.3. Material and Instrument

The Global School-Based Student Health Survey (GSHS), also known as the Encuesta Mundial de Salud Escolar in Spanish, is a self-administered survey assessing behavioral risk factors of youth 13 - 17 years of age in 10 health behavior domains. In this study, the physical activity sub-section of the GSHS core questionnaire (World Health Organization, 2021) was used. The GSHS has been used globally since 2003 for cross-national comparisons or to assess the prevalence of adolescent health needs and behaviors in a population, including Latin America (Aguilar-Farias et al., 2018). The test-retest reliability (Kendall's tau_b) of the core questions in the physical activity sub-section ranges from 0.73 to 0.81, and the content validity index on the core physical activity sub-section of the Persian version of the GSHS was 1 (indicating the items were highly relevant) (Ziaei et al., 2014).

For this study, 4 of the 6 core questions were used. Specifically, students were asked to report 1) the sum time they were “physically active for a total of at least 60 minutes per day” and respond on an ordinal scale of 0 - 7 days per week. Physical activity was defined as activity that increases their heart rate and makes them breathe hard. 2) The number of days they did “exercises to strengthen or tone your muscles, such as push-ups, sit-ups, or weightlifting” on an ordinal scale of 0 - 7 days per week. 3) How many hours per day (when not in school or doing homework) they spent sitting and watching television, playing computer games, talking with friends, using their mobile phone, or doing other sitting activities on an ordinal scale of <1, 1 - 2, 3 - 4, 5 - 6, 7 - 8, >8 hours per day. 4) The number of hours of sleep they got per night on an ordinal scale (4 or less, 5, 6, 7, 8, 9, 10 or more hours per night). Two questions (on active transportation and physical education) were not used as they did not directly relate to the aim of this pilot study.

All of the GSHS physical activity core questions were available in Spanish. However, the Spanish language version of the questions was checked for semantic and conceptual equivalence to the Costa Rican context. For example, the Costa Rican word for high school ‘colegio’ replaced ‘escuela’ (elementary school) in question 1 and the word for push-ups (question 2) was changed from “flexiones de brazos” (bending of the arms) to “lagartijas” (lizard), a common word used among Costa Rican youths to refer to push-ups. Where “you” as “vos” or “tú” in Spanish was

used, the third person singular “usted” was used instead. Culturally, the pronoun “usted” is generally used by Costa Ricans. These revisions were checked by two bilingual translators and the first author, who is also bilingual.

2.4. Procedure

One week prior to recruitment, an infographic describing the study was posted on the official social media site of each school and in Grade 9 group chats (e.g., WhatsApp). Students were subsequently recruited by the first author. A brief presentation was made to each class, and consent and assent forms were collected during the week following the presentation. In the second week, students completed the questionnaire during a physical education class. Data from absentees and students who chose to join the study later were collected in weeks 3 and 4. A prize draw for participating students for a Fitbit Inspire 3 Smartwatch occurred at each school at the end of week 4.

2.5. Data Analysis

Descriptive statistics were computed on each variable. Four GSHS core questions were converted into dichotomous scores (with 0 = not meeting the guideline, and 1 = meeting the guideline) so that these data could be compared with existing guidelines. The World Health Organization’s [WHO] (World Health Organization, 2020) MVPA and strength exercise guidelines for children and adolescents (aged 5 - 17 years) were used for comparison because Costa Rica’s current guidelines (Ministerio de Salud & Ministerio de Deporte y Recreación, 2011) were not developed specifically for Costa Rica but were based on WHO guidelines that are consistent with the current 2020 recommendations. Additionally, the Canadian 24-Hour Movement Guidelines for Children and Youth (5 - 17 years) (Tremblay et al., 2016) were used as Costa Rica does not have guidelines for adolescent sedentary behavior and sleep. The cut-offs for meeting the behavioral guidelines were: 1) Physical activity, ≥ 60 minutes of MVPA per day, 2) Strength, ≥ 3 days per week, 3) Sedentary, ≥ 3 hours per day as previously used with the GSHS (Guthold et al., 2010), and Sleep, 8 - 10 hours per night. A chi-squared test of independence was used to examine whether there was a gender-based difference in meeting each guideline. IBM SPSS Statistics Version 29.0 was used for all analyses.

3. Results

The proportion of students meeting individual guidelines was: MVPA = 11.0%, strength exercises = 40.7%, sedentary time = 32.2%, and sleep = 39.8% (Figure 1). The median number of days students engaged in the four movement behaviors is displayed in Table 2. The median scores for both males and females were below the levels recommended for optimal health for youth for MVPA, strength exercises, sleep, and sedentary time. Chi-squared analyses of the proportion of males and females meeting each health guideline revealed no gender-based differences: MVPA, $\chi^2 = 2.00$, $df = 1$, $p = 0.158$; Strength, $\chi^2 = 2.59$, $df = 1$, $p = 0.108$; Sedentary

behavior, $\chi^2 = 0.39$, $df = 1$, $p = 0.531$; and sleep, $\chi^2 = 1.96$, $df = 1$, $p = 0.162$. The proportion of students (all students and by gender) engaging in ≥ 60 minutes of MVPA and strength exercises per number of days per week is shown in **Table 3**. The proportion of students meeting all guidelines, individual guidelines, combinations of guidelines, or no guidelines is depicted in **Figure 1**. Notably, nearly one-third of students did not meet any health behavior guidelines, and 1 student met all 4 guidelines.

Table 2. Median and interquartile range (IQR, percentile 25 - percentile 75) of 24-hour movement behaviors.

Variables	Students					
	All (n = 118)		Male (n = 51)		Female (n = 67)	
	Median	IQR ^a	Median	IQR	Median	IQR
MVPA (days/week)	3	1 - 5	4	2 - 6	3	1 - 4
Strength (days/week)	2	1 - 3	2	1 - 5	2	1 - 3
Sedentary (hours/day)	3	2 - 4	3	2 - 4	3	2 - 4
Sleep (hours/night)	7	6 - 8	7	6 - 8	7	6 - 8

a: IQR = Interquartile Range.

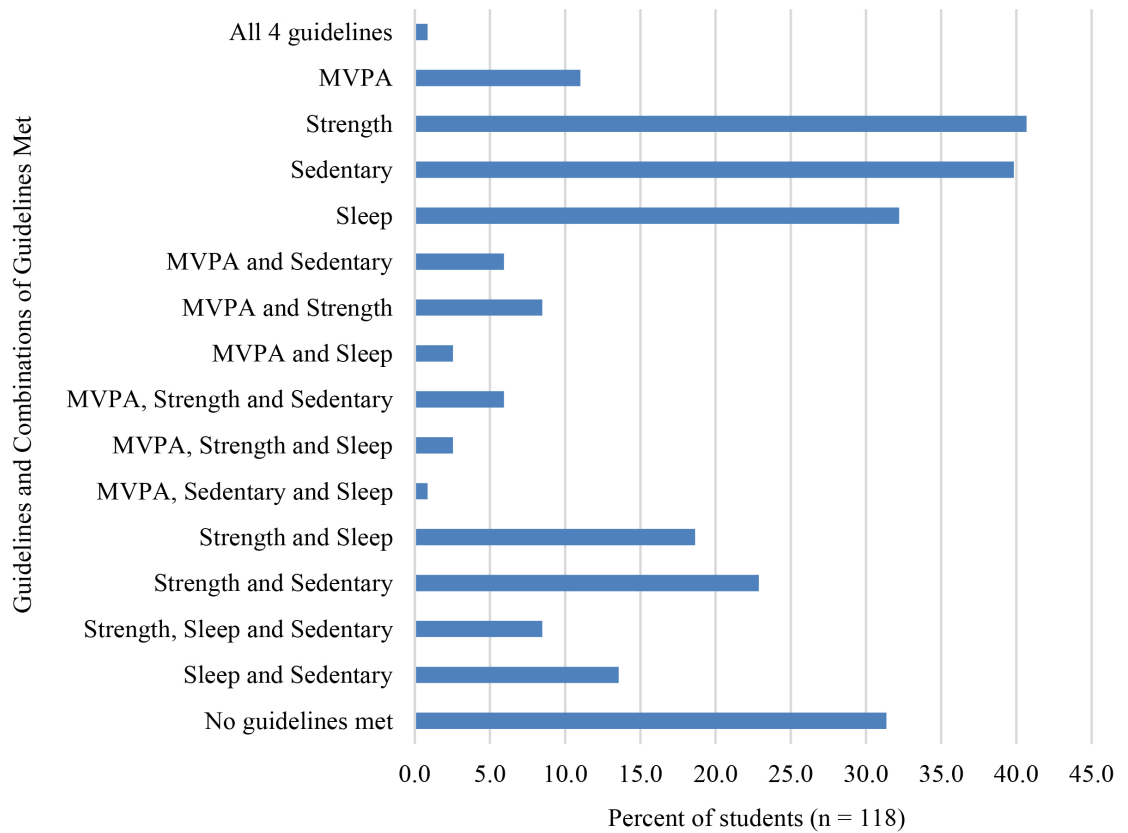


Figure 1. The proportion of students meeting individual and combinations of 24-hour movement behavior guidelines.

Table 3. The proportion of students (n = 118) engaging in ≥ 60 minutes of MPVA and strength exercises per number of days per week.

Behaviour	Days per Week						
	1	2	3	4	5	6	7
Proportion (%) of students engaging in							
≥ 60 min MVPA (all students)	7.6	19.5	11.9	19.5	9.3	15.3	5.9
Males	5.9	15.7	3.9	17.6	9.8	19.6	11.8
Females	9.0	22.4	17.9	20.9	9.0	11.9	1.5
Strength exercises (all students)	22.9	18.6	17.8	16.9	4.2	7.6	4.2
Males	21.6	19.6	9.8	17.6	2.0	11.8	7.8
Females	23.9	17.9	23.9	16.4	6.0	4.5	1.5

4. Discussion

Meeting individual and multiple 24-hour movement behavior guidelines is beneficial for young people's health. The median scores for all four 24-hour behavioral guidelines examined in this study were below the recommended levels, and the proportion of students meeting each guideline was low, especially for MVPA. In comparison to previous physical activity/inactivity levels of Costa Rican youth (Aguilar-Farias et al., 2018; Guthold et al., 2020), adolescents in this study were more inactive. For example, we found that 11.0% of students (15.7% of males and 7.5% of females) accrued ≥ 60 minutes of MVPA 7 days per week per day compared to Aguilar-Farias et al.'s findings, where 18.5% of students (24.7% of males and 12.1% of females) met the same criteria using the same GSHS MVPA question. Additionally, more than two-thirds of students in our study did not meet the sedentary behavior guideline, compared with 41% of males and 46% of females in Costa Rica in 2009 (da Silva et al., 2024).

Consistent with the widespread pattern of insufficient sleep among adolescents worldwide (Garipey et al., 2020), 60% of students in the current study did not meet the sleep duration guideline. As insufficient sleep in adolescence is associated with negative physical and mental health outcomes (Owens et al., 2014), poorer academic performance (Bao et al., 2024), and an increased risk of motor vehicle accidents (Owens et al., 2014), this finding is of concern. Also of concern are the findings that only one student met all the guidelines, and nearly one-third of students in the present study did not meet any of the guidelines. Meeting more of the 24-hour movement guidelines is associated with better academic performance (Bao et al., 2024), higher levels of wellbeing, mental and psychosocial health (Brown et al., 2021; Owens et al., 2014), and better physical health and health-related quality of life (Rollo et al., 2020) among adolescents.

Limitations

An important reason we conducted this pilot study was to examine the feasibility of recruiting participants. Despite the fact that the first author spoke Spanish, had

taught in this school district, had advertised via social media, was onsite to personally give a presentation, recruit, and collect data, and offered a prize draw to consenting students, recruitment was challenging. We acknowledge that the 18% response rate (17% public, 30% private) may bias results and limit generalizability to all Costa Rican Grade 9 students. In retrospect, these strategies were directed toward the students and their immediate environment, whereas parents and guardians were only asked to provide informed consent. Strategies to raise awareness in the community, e.g., via local stores and community organizations (Owens et al., 2017) prior to recruiting students at school may have been more successful. Physical activity was measured using one self-report GSHS core question (World Health Organization, 2021), which asked students how many days/week they accrued ≥ 60 minutes of MVPA. However, the 2020 WHO guidelines for MVPA are an average of 60 minutes/day across the week (Chaput et al., 2020) rather than every day. Therefore, our findings in relation to meeting the MVPA guideline are likely conservative. It should also be noted that because the GSHS core question regarding sedentary behavior does not only focus on recreational screen time, the cut-off of ≥ 3 hours per day, as previously used with the GSHS (Guthold et al., 2010), was used. Additionally, using accelerometry is desirable for measuring physical activity, sedentary behavior, and sleep in an integrated way (Rodrigues et al., 2025). We do, however, recommend supplementing accelerometry with other measures to capture all aspects of the 24-hour movement behaviors, such as strength exercises.

5. Conclusion

An aim of this pilot study was to provide preliminary evidence of the 24-hour movement behaviors of Grade 9 Costa Rican students. Our findings demonstrate that many Grade 9 students in the Guápiles' Regional Education Directorate of Costa Rica were not meeting guidelines for individual 24-hour movement behaviors or combinations of those behaviors. Contemporary "physical activity" research has moved to surveillance of integrated 24-hour movement behaviors as these behaviors are both interrelated and have a collective influence on young people's health. These pilot study findings demonstrate a need to concurrently examine the 24-hour movement behaviors of Costa Rican youth. Additionally, assessing health and academic outcomes associated with meeting individual and integrated 24-hour movement behavior guidelines is needed.

Acknowledgements

The authors wish to thank Marianne Chacón Mora and Marlin Barrif, who served as bilingual translators for this study.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- Aguilar-Farias, N., Martino-Fuentealba, P., Carcamo-Oyarzun, J., Cortinez-O’Ryan, A., Cristi-Montero, C., Von Oetinger, A. et al. (2018). A Regional Vision of Physical Activity, Sedentary Behaviour and Physical Education in Adolescents from Latin America and the Caribbean: Results from 26 Countries. *International Journal of Epidemiology*, *47*, 976-986. <https://doi.org/10.1093/ije/dyy033>
- Bang, F., Roberts, K. C., Chaput, J. P., Goldfield, G. S., & Prince, S. A. (2020). Physical Activity, Screen Time and Sleep Duration: Combined Associations with Psychosocial Health among Canadian Children and Youth. *Health Reports*, *31*, 9-16. <https://doi.org/10.25318/82-003-x202000500002-eng>
- Bao, R., Qin, H., Memon, A. R., Chen, S., López-Gil, J. F., Liu, S. et al. (2024). Is Adherence to the 24-H Movement Guidelines Associated with Greater Academic-Related Outcomes in Children and Adolescents? A Systematic Review and Meta-Analysis. *European Journal of Pediatrics*, *183*, 2003-2014. <https://doi.org/10.1007/s00431-024-05461-2>
- Brown, D. M. Y., Kwan, M. Y., Arbour-Nicitopoulos, K. P., & Cairney, J. (2021). Identifying Patterns of Movement Behaviours in Relation to Depressive Symptoms during Adolescence: A Latent Profile Analysis Approach. *Preventive Medicine*, *143*, Article ID: 106352. <https://doi.org/10.1016/j.ypmed.2020.106352>
- Chaput, J., Willumsen, J., Bull, F., Chou, R., Ekelund, U., Firth, J. et al. (2020). 2020 WHO Guidelines on Physical Activity and Sedentary Behaviour for Children and Adolescents Aged 5-17 Years: Summary of the Evidence. *International Journal of Behavioral Nutrition and Physical Activity*, *17*, Article No. 141. <https://doi.org/10.1186/s12966-020-01037-z>
- da Silva, J. I., de Souza Andrade, A. C., & Muraro, A. P. (2024). Global Physical Activity, Active Commuting to School, and Sedentary Behavior among Latin American Adolescents: Global School-Based Student Health Survey and the National School Health Survey. *Journal of Physical Activity and Health*, *21*, 879-889. <https://doi.org/10.1123/jpah.2022-0645>
- de Lannoy, L., Barbeau, K., Vanderloo, L. M., Goldfield, G., Lang, J. J., MacLeod, O. et al. (2023). Evidence Supporting a Combined Movement Behavior Approach for Children and Youth’s Mental Health—A Scoping Review and Environmental Scan. *Mental Health and Physical Activity*, *24*, Article ID: 100511. <https://doi.org/10.1016/j.mhpa.2023.100511>
- Faulkner, G., Weatherson, K., Patte, K., Qian, W., & Leatherdale, S. T. (2020). Are One-Year Changes in Adherence to the 24-Hour Movement Guidelines Associated with Flourishing among Canadian Youth? *Preventive Medicine*, *139*, Article ID: 106179. <https://doi.org/10.1016/j.ypmed.2020.106179>
- Ferrari, G., Alberico, C., Drenowatz, C., Kovalskys, I., Gómez, G., Rigotti, A. et al. (2022). Prevalence and Sociodemographic Correlates of Meeting the Canadian 24-Hour Movement Guidelines among Latin American Adults: A Multi-National Cross-Sectional Study. *BMC Public Health*, *22*, Article No. 217. <https://doi.org/10.1186/s12889-022-12613-2>
- Garipey, G., Danna, S., Gobiņa, I., Rasmussen, M., Gaspar de Matos, M., Tynjälä, J. et al. (2020). How Are Adolescents Sleeping? Adolescent Sleep Patterns and Sociodemographic Differences in 24 European and North American Countries. *Journal of Adolescent Health*, *66*, S81-S88. <https://doi.org/10.1016/j.jadohealth.2020.03.013>
- Guthold, R., Cowan, M. J., Autenrieth, C. S., Kann, L., & Riley, L. M. (2010). Physical Activity and Sedentary Behavior among Schoolchildren: A 34-Country Comparison. *The Journal of Pediatrics*, *157*, 43-49.e1. <https://doi.org/10.1016/j.jpeds.2010.01.019>

- Guthold, R., Stevens, G. A., Riley, L. M., & Bull, F. C. (2020). Global Trends in Insufficient Physical Activity among Adolescents: A Pooled Analysis of 298 Population-Based Surveys with 1-6 Million Participants. *The Lancet Child & Adolescent Health*, 4, 23-35. [https://doi.org/10.1016/s2352-4642\(19\)30323-2](https://doi.org/10.1016/s2352-4642(19)30323-2)
- Janssen, I., Roberts, K. C., & Thompson, W. (2017). Is Adherence to the Canadian 24-Hour Movement Behaviour Guidelines for Children and Youth Associated with Improved Indicators of Physical, Mental, and Social Health? *Applied Physiology, Nutrition, and Metabolism*, 42, 725-731. <https://doi.org/10.1139/apnm-2016-0681>
- Ministerio de Cultura Y Juventud (2013). *Segunda Encuesta Nacional de Juventudes: Informe de principales resultados*. <https://cpj.go.cr/segunda-encuesta-nacional-de-juventudes-2013/>
- Ministerio de Cultura Y Juventud (2018). *Tercera Encuesta Nacional de. Informe de Principales Resultados*. <https://cpj.go.cr/documento/informe-de-principales-resultados/>
- Ministerio de Salud y Ministerio de Deporte y Recreación (2011). *Plan Nacional de Actividad Física y Salud 2011-2021*. <https://repositorio-snp.mideplan.go.cr/handle/123456789/70?locale-attribute=en>
- Ministerio de Salud, & Caravaca Rodríguez, I. (2019). *Informe Ejecutivo Encuesta Colegial 2018*.
- Owens, J., Au, R., Carskadon, M., Millman, R., Wolfson, A., Braverman, P. K. et al. (2014). Insufficient Sleep in Adolescents and Young Adults: An Update on Causes and Consequences. *Pediatrics*, 134, e921-e932. <https://doi.org/10.1542/peds.2014-1696>
- Owens, O. L., James, C., & Friedman, D. B. (2017). Overcoming the Challenges of African-American Recruitment in Health Sciences Research: Strategies and Recommendations. *Urologic Nursing*, 37, 293-315. <https://doi.org/10.7257/1053-816x.2017.37.6.293>
- Rodrigues, B., Videira-Silva, A., Lopes, L., Sousa-Sá, E., Vale, S., Cliff, D. P. et al. (2025). Methodological Choices on 24-H Movement Behavior Assessment by Accelerometry: A Scoping Review. *Sports Medicine-Open*, 11, Article No. 25. <https://doi.org/10.1186/s40798-025-00820-1>
- Rollo, S., Antsygina, O., & Tremblay, M. S. (2020). The Whole Day Matters: Understanding 24-Hour Movement Guideline Adherence and Relationships with Health Indicators across the Lifespan. *Journal of Sport and Health Science*, 9, 493-510. <https://doi.org/10.1016/j.jshs.2020.07.004>
- Sampasa-Kanyinga, H., Standage, M., Tremblay, M. S., Katzmarzyk, P. T., Hu, G., Kuriyan, R. et al. (2017). Associations between Meeting Combinations of 24-H Movement Guidelines and Health-Related Quality of Life in Children from 12 Countries. *Public Health*, 153, 16-24. <https://doi.org/10.1016/j.puhe.2017.07.010>
- Tremblay, M. S., Carson, V., Chaput, J., Connor Gorber, S., Dinh, T., Duggan, M. et al. (2016). Canadian 24-Hour Movement Guidelines for Children and Youth: An Integration of Physical Activity, Sedentary Behaviour, and Sleep. *Applied Physiology, Nutrition, and Metabolism*, 41, S311-S327. <https://doi.org/10.1139/apnm-2016-0151>
- van Teijlingen, E., & Hundley, V. (2002). The Importance of Pilot Studies. *Nursing Standard*, 16, 33-36. <https://doi.org/10.7748/ns2002.06.16.40.33.c3214>
- Wilhite, K., Booker, B., Huang, B., Antczak, D., Corbett, L., Parker, P. et al. (2023). Combinations of Physical Activity, Sedentary Behavior, and Sleep Duration and Their Associations with Physical, Psychological, and Educational Outcomes in Children and Adolescents: A Systematic Review. *American Journal of Epidemiology*, 192, 665-679. <https://doi.org/10.1093/aje/kwac212>
- World Health Organization (2020). *WHO Guidelines on Physical Activity and Sedentary*

Behaviour. Author. <https://www.who.int/publications/i/item/9789240015128>

World Health Organization (2021). *GSHS Core Questionnaire Modules*. WHO.

[https://www.who.int/publications/m/item/gshs-core-questionnaire-modules-\(2021\)](https://www.who.int/publications/m/item/gshs-core-questionnaire-modules-(2021))

Ziaei, R., Dastgiri, S., Soares, J., Baybordi, E., Zeinalzade, A. H., Rahimi, V. A., & Mohammadi, R. (2014). Reliability and Validity of the Persian Version of Global School-Based Student Health Survey Adapted for Iranian School Students. *Journal of Clinical Research & Governance*, 3, 134-140.