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Factor associated with physical activity level among secondary boarding school students in Selangor, Malaysia

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ABSTRACT

This cross-sectional study aimed to assess the prevalence and factors associated with physical activity among secondary boarding school students. Data were collected using a self-administered questionnaire that captured socio-demographic information, physical activity levels, sedentary behavior, social support (from family and peers), and psychological factors (depression, anxiety, and stress). Anthropometric measurements, including height and weight, were obtained using a SECA217 stadiometer and a Tanita weighing scale, with body mass index (BMI)-for-age subsequently calculated. A total of 181 participants were included in the study. The results indicated that the majority of students met the recommended physical activity guidelines. Approximately two-thirds of participants were classified as having a normal BMI, while the majority exhibited high levels of sedentary behavior. Regarding social support, only one-fifth of students reported receiving adequate family support, while half of the students reported adequate peer support. Psychological assessments revealed that one-third of participants exhibited normal depressive symptoms, whereas nearly half exhibited symptoms of anxiety and stress. Significant associations were identified between physical activity levels and several factors, including age, gender, family support, peer support, and stress. In conclusion, while most secondary boarding school students in this study met the recommended daily amount of physical activity, high levels of sedentary behavior and varying levels of social support and psychological distress highlight areas that warrant further intervention.

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1. INTRODUCTION

The World Health Organization (WHO) recommends that individuals aged 5 to 17 engage in at least 60 minutes of moderate-to-vigorous intensity aerobic activity daily, distributed throughout the week. Additionally, vigorous-intensity aerobic activities, as well as exercises that strengthen muscles and bones, should be incorporated at least three days a week. Limiting sedentary behavior, particularly recreational screen time, is also emphasized as critical for adolescents [1]. The WHO's 2022 global status report on physical activity presented alarming findings: 81% of adolescents and 27% of adults worldwide do not meet the recommended physical activity levels. Among adolescents, girls were found to be less active than boys, with inactivity rates of 85% and 77.6%, respectively.

In Malaysia, physical inactivity is a growing concern, particularly among adolescents. A study highlighted that Malaysia has higher rates of physical inactivity and associated mortality compared to global

averages [2]. According to the National Health and Morbidity Survey (NHMS) 2012, only 42.7% of Malaysian adolescents were physically active, with boys (54.4%) being more active than girls (31.1%) [3]. Recent data from the NHMS adolescent health survey 2022 indicates that only 21.4% of adolescents in Malaysia are physically active [4]. These findings underscore the urgent need to address insufficient physical activity among Malaysian youth.

Sedentary behavior refers to any waking activity with an energy expenditure of 1.5 METs or less while sitting, reclining, or lying down. This includes activities such as desk-based office work, driving, and watching television, and is also relevant for individuals unable to stand, such as wheelchair users [5]. Local research on sedentary behavior remains limited, but previous studies have established an association between sedentary behavior and physical activity levels among adolescents. Notably, individuals may achieve the recommended levels of physical activity, yet they can still spend a large portion of their day engaged in sedentary activities, such as sitting [6]. A systematic review by Ma *et al.* [7], revealed that nearly half of adolescents were sedentary after school hours, a pattern with significant health implications. In a study of 180,298 adolescents aged 12–15 years, only 15.3% met the recommended physical activity level (at least 60 minutes of physical activity per day, as per WHO guidelines). Furthermore, 64.6% exhibited low sedentary behavior (defined as 2 hours or less of sitting activities per day, excluding school or homework time). Only 9.1% of adolescents met both the physical activity and sedentary behavior recommendations [7].

In Malaysia, research on physical activity and sedentary behavior often centers on general secondary school students, neglecting the unique characteristics of boarding school students, who face distinct challenges and lifestyle patterns. Boarding school students live on campus for extended periods, often with less parental involvement compared to students who live at home. Their structured daily routines, including specific times allocated for classes, meals, study, and extracurricular activities, create a distinct environment for physical activity. This makes it essential to investigate physical activity levels among boarding school students, as their experiences differ significantly from those of day school students. This study aims to assess the physical activity levels of secondary boarding school students and explore the potential associations between these levels and various factors such as socio-demographics, body mass index, sedentary behavior, social support, and psychological aspects. By examining these relationships, the study seeks to provide valuable insights into the factors influencing physical activity in this unique population, with the goal of informing targeted interventions and policies to promote adolescent health.

2. METHOD

2.1. Design and sample size

This cross-sectional study was conducted in a secondary boarding school located in Selangor, Malaysia. The sample size was determined using Daniel's (1999) formula [8]. Based on the NHMS 2022 [4] prevalence of physically active adolescents in Malaysia (21.4%), the required sample size was calculated to be 82 secondary boarding school students. This accounted for a margin of error or absolute precision of ±10% in estimating the prevalence with 95% confidence, while also considering a potential 20% attrition rate. Consequently, the anticipated 95% confidence interval ranged from 11.4% to 31.4%. The sample size was computed using the Scalex SP calculator Naing *et al*. [9] in conjunction with Daniel's (1999) formula.

2.2. Participants and recruitment

A multistage sampling technique was utilized to recruit participants. The school consisted of five student groups, but only Forms 1, 2, and 4 were included in the study. Form 5 students were excluded due to their national examination schedules. Three classes were randomly selected from each of Forms 1, 2, and 4, and all students within the selected classes were invited to participate in the study.

2.3. Research instruments

A self-administered questionnaire in Malay was used, incorporating validated and reliable instruments: i) The physical activity questionnaire for children (PAQ-C) for assessing physical activity levels; ii) The Adolescent sedentary activity questionnaire, developed by Hardy *et al*. [10] for measuring sedentary behavior, the social support scale for exercise (Malay Version, validated by Sabo *et al.* [11] for evaluating social support from friends and family; and iii) The depression, anxiety, and stress scale - 21 Items (DASS-21) for assessing psychological factors. Height and weight were also measured to calculate body mass index (BMI) and BMI-for-age Z-scores. Data collection took place on-site in December 2023, with informed consent obtained from both participants and their parents or guardians.

2.4. Statistical analysis

Statistical analysis was performed using IBM SPSS version 26, with significance levels set at $p<0.05$. Univariate analysis was employed for descriptive data, with categorical variables presented as

frequencies and percentages, and continuous variables as means and standard deviations. Pearson correlation and chi-square tests were used for bivariate analysis to examine the associations between independent variables (e.g., sociodemographic factors, BMI, sedentary behavior, social support, psychological factors) and the dependent variable (physical activity level).

3. RESULTS AND DISCUSSION

A total of 181 participants were involved in the study, with a mean age of 14.38±1.20 years. Table 1 shows the distribution of participants in this study. The majority of participants were female (63.5%), while males accounted for 36.5%. Nearly 75% of participants' parents had attained tertiary education, indicating a relatively high level of parental education. In terms of family income, 40.8% of participants belonged to the B40 category (low income, below RM5,250), 32.9% were in the M40 category (middle income, between RM5,250 and RM11,819), and 24.3% were in the T20 category (high income, above RM11,820).

Only 4.4% of participants did not meet the recommended physical activity guidelines, while 95.6% exceeded the recommendation of engaging in at least 420 minutes of moderate-to-vigorous physical activity (MVPA) per week. This indicates a high level of physical activity among the study population. By comparison, the NHMS 2022 reported that only 21.4% of Malaysian adolescents achieved the recommended 60 minutes of daily physical activity. Previous research supports the trend that adolescents generally allocate insufficient time to physical activity [12], [13]. However, the present study reveals a striking contrast with national data, showing that boarding school adolescents demonstrate significantly higher levels of physical activity. The structured schedules and mandatory participation in sports and recreational activities within boarding schools are key factors contributing to this elevated physical activity. The availability of school recreational facilities also plays a critical role in involvement with moderate to vigorous physical activity among adolescents [14].

In terms of BMI, 63.5% of participants had a normal weight, while 21.5% were categorized as overweight and 13.3% as obese. A small proportion of participants (1.7%) were underweight. These results align with NHMS 2022 data, which indicate that 59.6% of Malaysian children and adolescents aged 5 to 17 years had a body mass index for age z-score (BAZ) in the normal range, with 17.8% classified as overweight and 14.3% as obese. These findings are consistent with previous studies, which reported similar BAZ distributions among adolescents [15]. One prior local study observed that approximately 68% of participants had a normal BMI, aligning with the current study's findings. That study also reported that 50.6% of participants had a normal BAZ, with 27.5% falling into the overweight or obese category. Interestingly, the prevalence of underweight individuals was slightly higher in the previous study, at 22% of the sample [16].

The average time participants spent on sedentary behaviors over a week (7 days) was 529.15±250.15 minutes per day, which equates to approximately 9 hours of sedentary activity daily. Among the different sedentary activities, the highest average time was spent on social activities, with participants engaging in these activities for 1,330.42±995.34 minutes per week. The time spent on educational and cultural sedentary activities averaged 461.26±302.21 minutes and 267.28±276.95 minutes per week, respectively. In contrast, participants reported lower levels of screen time and travel-related sedentary activities, with averages of 70.48± 90.47 minutes and 40.63±108.76 minutes per week, respectively. Overall, 87.6% of participants were classified as having high sedentary levels, spending more than 4 hours per day on sedentary activities, while only 12.4% were classified as having low sedentary levels.

In comparison to the findings of the NHMS 2022, this study revealed that a significant proportion (66.7%) of participants spent at least three hours per day engaged in sedentary activities. Previous research reported a slightly lower prevalence of sedentary behavior, with approximately 62.5% of respondents classified as sedentary [6]. Conversely, a global study indicated a higher prevalence of low sedentary behavior, with 64.6% of respondents falling into this category, contrasting with the lower prevalence (12.4%) observed in the current study [7]. The elevated sedentary behavior in this study may be attributable to the boarding school environment, where students spend more time socializing with peers due to limited access to electronic devices and a greater focus on academic activities and revision.

Adequate support from both parents and peers is known to positively influence adolescents' physical activity [17]. In this study, half of the participants reported receiving sufficient support for physical activity, while the other half indicated low levels of support. This may reflect the boarding school context, where students spend significant time with peers, resulting in higher levels of peer support compared to parental support. Previous research has highlighted that support from friends, parents, and teachers often plays a more substantial role in participation in physical activity [18].

Table 1. Mean ± SD and distribution of respondents of the study

Variable (s)	Mean±SD	Frequency	Percent (%)
Age group	14.38±1.20		
13 years old		49	27.2
14 years old		72	40.0
16 years old		59	32.8
Sex			
Male		66	36.5
Female		115	63.5
Father's education			
Primary			
Secondary		2	1.1
Tertiary		43	24.0
Mother's education			
Primary		2	1.1
Secondary		43	24.0
Tertiary		134	74.9
Household income status*	7903.97±5425.67		
B40		62	40.8
M40		53	32.9
T20		37	24.3
Physical activity level			
Weekly physical activity spends (minutes)	1374.77±560.99		
Not meeting physical activity recommendations (<420 min weekly)		8	4.4
Meeting physical activity recommendations (≥420 min weekly)		172	95.6
Anthropometric indicator			
Height (m)	158.60±8.15		
Weight (kg)	55.81±12.98		
BMI (kg/m^2)	22.08±4.32		
BMI z-score	0.50±1.17		
BMI status thinness ≥ 1 SD < -2SD		3	1.7
Normal ≤ -2 SD and		115	63.5
Overweight > +1 SD		39	21.5
Obesity > +SD		24	13.3
Sedentary behavior			
ASAQ score weekly	529.15±250.15		
Screen time activities	70.48±90.47		
Education activities	461.26±302.21		
Travel activities	40.63±108.76		
Cultural activities	267.28±276.95		
Social activities	1330.42±995.34		
Low sedentary <4 hours per day		22	12.4
High sedentary ≥4 hours per day		155	87.6
Psychological indicator			
Family's support	27.16±10.25		
Low support		145	80.6
Adequate support		35	19.4
Peers' support	36.58± 1.85		
Low support		90	50.0
Adequate support		90	50.0
Depression score	7.74 ± 7.20		
Depression level			
Normal		114	62.6
Mild		28	15.4
Moderate		31	17.0
Severe		6	3.3
Extremely severe		3	1.6
Anxiety score	9.08±7.04		
Anxiety level			
Normal		80	44.0
Mild		24	13.2
Moderate		43	23.6
Severe		15	8.2
Extremely severe		20	11.0
Stress score	11.83±8.26		
Stress level			
Normal		89	49.4
Mild		55	30.6
Moderate		27	15.0
Severe		8	4.4
Extremely severe		1	0.6

1USD=RM4.20 Classification of income categories B40, M40, and T20 stand for Bottom 40%, Middle 40% and Top 20% respectively based on median household income B40 (< RM3860), M40 (RM3860 – RM8,319), T20 (> RM8319)

Nearly half of the participants were considered asymptomatic for anxiety (44.0%) and stress (49.4%), while more than half were asymptomatic for depression (62.6%). A small percentage of participants reported experiencing extreme levels of depression (1.6%) and stress (0.6%). Additionally, 11% of participants reported severe anxiety, a rate higher than those for depression and stress. A previous study reported the prevalence of depressive symptoms among adolescents to be 19%, which is lower than the 37.4% found in the current study [19]. Similarly, anxiety prevalence in the prior study was high (63.8%), aligning with the current study's findings of 54% [20]. Oliveira *et al*. [21] reported that approximately 44% of adolescents had a high perception of stress, consistent with the 51% observed in this study. Collectively, these findings suggest that a substantial proportion of participants in this study are experiencing symptoms of depression, anxiety, and stress, with approximately half affected by anxiety and stress and one-third affected by depressive symptoms, indicating a worsening situation among these adolescents.

Table 2 presents the relationship between sociodemographic factors and weekly physical activity. A significant association was also found between gender and physical activity levels ($p = 0.024$). All male participants (100%) met the recommended physical activity levels, compared to 93% of females, with 7% of females falling short of the recommendations. This is consistent with previous research linking gender to physical activity levels, where male students typically exhibit higher activity levels [6], [12]. The gender disparity in physical activity may be influenced by sociocultural factors, such as the association between masculinity and physical activity and the tendency for female adolescents to prioritize academics and household responsibilities over physical exercise.

A significant, strong negative correlation was found between age and weekly physical activity ($r = -0.76$, $p<0.001$), suggesting that as age increases, time spent on physical activity decreases. This finding aligns with prior research, which also identified a significant association between age and physical activity engagement [22], [23]. Fuentealba-Urra *et al*. [24] noted that the transition from childhood to adolescence often results in a decline in both the frequency and duration of physical activity.

No significant associations were found between parents' educational levels and physical activity ($p = 0.410$). This finding is consistent with some studies [6], [25] but contrasts with others that have suggested a significant impact of a father's education on adolescents' physical activity levels [26]. These discrepancies may be attributed to variations in sample size and population characteristics.

Similarly, no significant relationship was found between household income and weekly physical activity ($r = 0.02$, $p = 0.780$). While local studies also report no correlation between income and physical activity [12], other research has identified a significant association [25]. In this study, equal access to school-provided sports facilities across income levels may explain the lack of income-related differences in physical activity.

Table 3 shows the correlation between BMI-for-age Z-score (BAZ), sociological factors (family and peer support, depression, anxiety, and stress), sedentary behaviors, and weekly physical activity (minutes). BMI was not significantly associated with weekly physical activity ($r = 0.14$, $p = 0.062$). This aligns with prior research, which often finds no direct relationship between physical activity and BMI among adolescents [12]. However, some studies suggest that obese adolescents may engage in more physical activity, possibly as a weight-loss strategy [27]. The use of self-reported questionnaires may have contributed to overestimation in physical activity levels, as studies using objective measures like accelerometers have shown more significant associations [28].

There was no significant relationship between sedentary behavior and physical activity ($r = -0.071$, $p = 0.347$). This differs from studies showing that physical and sedentary behaviors can coexist [6]. It is possible that adolescents may engage in physical activity while still spending significant amounts of time in sedentary activities.

Table 2. Relationship between sociodemographic factors with weekly physical activity spent (minutes)

Variables		Meet recommendation	Not meet recommendation	
	r	n (%)	n (%)	p
Age	-0.76[a]			< 0.001[a] *
Sex				
Male		0 (0.0)	66 (100.0)	0.024 [b] *
Female		8 (7.0)	106 (93.0)	
Father's education level				
Secondary or lower		2 (4.5)	42 (95.5)	1.000 [b]
Tertiary		6 (4.5)	128 (95.5)	
Mother's education level				
Secondary or lower		3 (6.8)	41 (93.2)	0.410[b]
Tertiary		5 (3.7)	128 (96.3)	
Household income status	0.02 [a]			0.780 [a]

Note: [a] Pearson product-moment correlation; [b] Fisher's Exact Test.

Social support emerged as a significant factor influencing physical activity. A weak positive relationship was found between family support and weekly physical activity ($r = 0.28$, $p<0.001$), and a moderate positive relationship was observed with peer support ($r = 0.39$, $p<0.001$). These findings echo previous research, which highlights the importance of social support from friends and family in promoting physical activity among adolescents [29]. Friends, in particular, can encourage physical activity through shared habits and participation in active pursuits.

Lastly, a weak negative relationship was found between stress and physical activity ($r = -0.18$, $p = 0.016$). Higher stress levels were associated with reduced physical activity, supporting research showing that stress can diminish exercise engagement [30]. Although exercise is known to alleviate stress, individuals often opt for sedentary activities during stressful periods, potentially due to perceived lack of time and energy [31], [32]. No significant associations were found between depressive symptoms ($r = -0.11$, $p = 0.130$) or anxiety symptoms ($r = -0.14$, $p = 0.060$) and physical activity, although previous studies have shown mixed results regarding these relationships.

Table 3. Correlation between BMI-for-age Z-score (BAZ), sociological factors (family & peers support, depression, anxiety & stress), sedentary behaviors with weekly physical activity spent (minutes)

Variable	Weekly physical activity spent (minutes)	
	r	p-value
BAZ	0.14	0.062
Family support	0.28	<0.001*
Peers support	0.39	<0.001*
Depression	-0.11	0.130
Anxiety	-0.14	0.060
Stress	-0.18	0.016*
Total sedentary behavior in week (minutes)	-0.071	0.347

4. CONCLUSION

This study found that four out of five students met the World Health Organization's recommendation of 420 minutes of physical activity per week. This is markedly higher than national data, which suggests that only 1 in 5 adolescents in Malaysia are physically active. The structured environment, access to well-equipped facilities, and scheduled recreational activities in boarding schools likely contribute to this high level of activity. However, despite high physical activity levels, students still spent an average of 9 hours per day in sedentary activities. Significant associations were identified between age, gender, social support, and stress with physical activity levels. Social support, both from family and peers, was particularly influential, with higher levels of support corresponding to greater physical activity. Stress, on the other hand, was negatively associated with physical activity, indicating that stress may hinder students' participation in exercise. While the boarding school environment appears to promote physical activity, efforts are needed to address sedentary behavior and the psychological factors, such as stress, that negatively impact physical activity. Future research should aim to include more diverse samples from different locations to better understand these associations and to inform the development of targeted interventions that can be applied more broadly.

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AUTHOR CONTRIBUTIONS STATEMENT

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Hazizi Abu Saad	✓	✓					✓	✓		✓	✓	✓	✓	✓

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

The research related to human use has been compiled with all the relevant national regulations and institutional policies in accordance with the tenets of the Helsinki Declaration and has been approved by the authors' institutional review board (Approval No: JKEUPM-2023-673).

DATA AVAILABILITY

The data that support the findings of this study are available on request from the corresponding author, [HAS]. The data, which contains information that could compromise the privacy of research participants, is not publicly available due to certain restrictions.

REFERENCES

[1] World Health Organization, "Physical activity. Fact sheet." https://www.who.int/news-room/fact-sheets/detail/physical-activity (accessed Apr. 05, 2023).
[2] S. Khoo, B. K. Poh, S. A. Suhaimi, K. H. Chong, and A. Ramirez Varela, "Physical activity promotion in Malaysia: Challenges and opportunities," *Frontiers in Public Health*, vol. 8, Oct. 2020, doi: 10.3389/fpubh.2020.536239.
[3] Institute for Public Health (IPH), "Technical report national health and morbidity survey (NHMS) 2022: Adolescent health survey, Malaysia." https://iku.gov.my/images/nhms-2022/Report_Malaysia_nhms_ahs_2022.pdf (accessed Sep. 25, 2023).
[4] Institute for Public Health (IPH), "The national health and morbidity survey: Malaysia global school-based student health survey 2022," *Ministry of Health Malaysia*. https://iku.gov.my/nhms-ahs-2022-state-report (accessed Jul. 15, 2023).
[5] World Health Organization, *WHO guidelines on physical activity and sedentary behaviour*. 2020.
[6] K. Jha, R. S. Blumenthal, and G. Sharma, "Sit less and move more: Is maintaining physical activity enough to reduce cardiometabolic risk in adults with prolonged sedentary behavior? - American college of cardiology," *American College of Cardiology*, 2021. https://www.acc.org/latest-in-cardiology/articles/2021/08/24/13/59/sit-less-and-move-more (accessed Sep. 13, 2024).
[7] C. Ma, Y. Zhang, M. Zhao, P. Bovet, and B. Xi, "Physical activity and sedentary behavior among young adolescents in 68 LMICs, and their relationships with national economic development," *International Journal of Environmental Research and Public Health*, vol. 17, no. 21, p. 7752, Oct. 2020, doi: 10.3390/ijerph17217752.
[8] W. W. Daniel, *Biostatistics: A foundation for analysis in the health sciences*, 7th ed., vol. 44, no. 1. 1999. doi: 10.2307/2531929.
[9] L. Naing, R. Bin Nordin, H. Abdul Rahman, and Y. T. Naing, "Sample size calculation for prevalence studies using Scalex and ScalaR calculators," *BMC Medical Research Methodology*, vol. 22, no. 1, pp. 1–8, 2022, doi: 10.1186/s12874-022-01694-7.
[10] L. L. Hardy, M. L. Booth, and A. D. Okely, "The reliability of the adolescent sedentary activity questionnaire (ASAQ)," *Preventive Medicine*, vol. 45, no. 1, pp. 71–74, Jul. 2007, doi: 10.1016/j.ypmed.2007.03.014.
[11] A. Sabo, Y. C. Kueh, W. N. Arifin, Y. Kim, and G. Kuan, "The validity and reliability of the Malay version of the social support for exercise and physical environment for physical activity scales," *PLOS ONE*, vol. 15, no. 9, p. e0239725, Sep. 2020, doi: 10.1371/journal.pone.0239725.
[12] M. S. Tremblay, "Challenges in global surveillance of physical activity," *The Lancet Child and Adolescent Health*, vol. 4, no. 1, pp. 2–3, 2020, doi: 10.1016/S2352-4642(19)30348-7.
[13] G. R, S. GA, R. LM, and B. FC, "Global trends in insufficient physical activity among adolescents: A pooled analysis of 298 population-based surveys with 1.6 million participants," *Yearbook of Paediatric Endocrinology*, 2020, doi: 10.1530/ey.17.13.12.
[14] J. Guerra, J. Jhon, K. Lanza, G. Castro, and N. C. Barengo, "The availability between recreational facilities and physical activity of US adolescents," *Preventive Medicine Reports*, vol. 38, p. 102592, Feb. 2024, doi: 10.1016/j.pmedr.2024.102592.
[15] A. K. G. Tan, S. T. Yen, X. Fang, and F.-S. Chiang, "Body weight and physical activity of adolescents in Malaysia," *International Health*, vol. 11, no. 2, pp. 150–158, Mar. 2019, doi: 10.1093/inthealth/ihy072.

[16] A. Mahaletchumy, L. Rampal, and Z. M. Sharif, "Prevalence of overweight/obesity and its associated factors among secondary school students in semi urban area in Malaysia," *Medical Journal of Malaysia*, vol. 74, no. 6, pp. 513–520, 2019.
[17] S. R. Khan, R. Uddin, S. Mandic, and A. Khan, "Parental and peer support are associated with physical activity in adolescents: Evidence from 74 countries," *International Journal of Environmental Research and Public Health*, vol. 17, no. 12, p. 4435, Jun. 2020, doi: 10.3390/ijerph17124435.
[18] D. Hu, S. Zhou, Z. J. Crowley-Mchattan, and Z. Liu, "Factors that influence participation in physical activity in school-aged children and adolescents: A systematic review from the social ecological model perspective," *International Journal of Environmental Research and Public Health*, vol. 18, no. 6, pp. 1–20, 2021, doi: 10.3390/ijerph18063147.
[19] S. Singh *et al.*, "Prevalence and determinants of depressive symptoms among young adolescents in Malaysia: A Cross-sectional study," *Children*, vol. 10, no. 1, p. 141, Jan. 2023, doi: 10.3390/children10010141.
[20] D. P. Priasmoro, I. Y. Kusuma, and Y. Asri, "Social anxiety disorder: prevalence and dominant factor among adolescents in urban and rural school," *International Journal of Public Health Science (IJPHS)*, vol. 13, no. 2, p. 919, 2024, doi: 10.11591/ijphs.v13i2.23610.
[21] A. Oliveira, L. S. Batista, and D. H. Bandoni, "Perceived stress, body image satisfaction and dysfunctional eating behavior among adolescents in the metropolitan region of São Paulo, Brazil: Prospective cohort study," *Current Developments in Nutrition*, vol. 8, p. 103361, 2024, doi: 10.1016/j.cdnut.2024.103361.
[22] S. Aubert *et al.*, "Global prevalence of physical activity for children and adolescents; inconsistencies, research gaps, and recommendations: a narrative review," *International Journal of Behavioral Nutrition and Physical Activity*, vol. 18, no. 1, 2021, doi: 10.1186/s12966-021-01155-2.
[23] A. Marques *et al.*, "Prevalence of physical activity among adolescents from 105 low, middle, and high-income countries," *International Journal of Environmental Research and Public Health*, vol. 17, no. 9, p. 3145, Apr. 2020, doi: 10.3390/ijerph17093145.
[24] S. Fuentealba-Urra *et al.*, "Physical activity habits and their relationship with sociodemographic factors in Chilean adolescents," *Frontiers in Psychology*, vol. 13, 2022, doi: 10.3389/fpsyg.2022.915314.
[25] M. Alharbi, "Influence of individual and family factors on physical activity among Saudi girls: A cross-sectional study," *Annals of Saudi Medicine*, vol. 39, no. 1, pp. 13–21, 2019, doi: 10.5144/0256-4947.2019.13.
[26] Y. Ke, L. Shi, L. Peng, S. Chen, J. Hong, and Y. Liu, "Associations between socioeconomic status and physical activity: A cross-sectional analysis of Chinese children and adolescents," *Frontiers in Psychology*, vol. 13, Sep. 2022, doi: 10.3389/fpsyg.2022.904506.
[27] L. Cleven *et al.*, "Association between physical activity and longitudinal change in body mass index in middle-aged and older adults," *BMC Public Health*, vol. 23, no. 1, p. 202, Jan. 2023, doi: 10.1186/s12889-023-15119-7.
[28] A. VandeBunte *et al.*, "Physical activity measurement in older adults: Wearables versus self-report," *Frontiers in Digital Health*, vol. 4, Aug. 2022, doi: 10.3389/fdgth.2022.869790.
[29] E. M. de Camargo, C. G. da Costa, T. S. Piola, E. D. A. Bacil, J. F. López-Gil, and W. de Campos, "Is greater social support from parents and friends related to higher physical activity levels among adolescents?," *Children*, vol. 10, no. 4, p. 701, Apr. 2023, doi: 10.3390/children10040701.
[30] M. Reichert *et al.*, "The association of stress and physical activity: Mind the ecological fallacy," *German Journal of Exercise and Sport Research*, vol. 52, no. 2, pp. 282–289, 2022, doi: 10.1007/s12662-022-00823-0.
[31] D. Schultchen *et al.*, "Bidirectional relationship of stress and affect with physical activity and healthy eating," *British Journal of Health Psychology*, vol. 24, no. 2, pp. 315–333, May 2019, doi: 10.1111/bjhp.12355.

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