Effects of Nutrition Habits and Sedentary Time on Psychological Distress in Adolescents

Selin. Kaya [ID][1], Emre. Yildiz [ID][2*]

1   Department of Clinical Psychology, Bogazici University, Istanbul, Turkiye

2   Department of General Psychology, Middle East Technical University, Ankara, Turkiye (Email: emre.yildiz@metu.edu.tr)

ABSTRACT

This study aimed to examine the predictive relationship between nutrition habits, sedentary time, and psychological distress in adolescents. A correlational descriptive study was conducted among 424 adolescents aged 12 to 18 years from secondary and high schools in Turkey. Participants were selected using stratified random sampling based on the Morgan and Krejcie sample size table. Data were collected using three standardized instruments: the Kessler Psychological Distress Scale (K10), the Adolescent Food Habits Checklist (AFHC), and the Adolescent Sedentary Activity Questionnaire (ASAQ). Statistical analyses were performed using SPSS version 27. Pearson correlation was used to assess bivariate associations between psychological distress and each independent variable, while multiple linear regression was conducted to examine the joint predictive value of nutrition habits and sedentary time on psychological distress. All assumptions for parametric tests were checked and confirmed. Pearson correlation analysis revealed a significant negative association between psychological distress and nutrition habits ($r = -0.41$, $p < .01$), and a significant positive association between psychological distress and sedentary time ($r = 0.47$, $p < .01$). Multiple regression analysis showed that the model was statistically significant ($F(2, 421) = 86.48$, $p < .001$), accounting for 30% of the variance in psychological distress ($R^2 = .30$, Adjusted $R^2 = .29$). Both nutrition habits ($\beta = -0.33$, $t = -6.07$, $p < .001$) and sedentary time ($\beta = 0.39$, $t = 6.83$, $p < .001$) were significant predictors. The findings suggest that poor nutrition habits and increased sedentary time are significant and independent predictors of psychological distress in adolescents. Interventions targeting healthier eating and reduced sedentary behavior may help mitigate mental health challenges in this age group.

Keywords: Adolescents, Psychological Distress, Nutrition Habits, Sedentary Time, Mental Health, Regression Analysis, Lifestyle Factors.

Introduction

Adolescence is a critical period marked by profound physical, emotional, and social changes that shape mental and behavioral health trajectories into adulthood. During this stage, adolescents experience heightened vulnerability to psychological distress, which includes symptoms of anxiety, depression, and emotional dysregulation. The global rise in mental health problems among adolescents has become a pressing public health concern, with lifestyle behaviors such as poor nutrition and excessive sedentary time

identified as contributing factors (1, 2). As youth increasingly adopt digital and screen-based routines that displace physical activity and healthy dietary patterns, understanding the interplay of these lifestyle components with psychological distress becomes crucial for developing effective prevention and intervention strategies.

Psychological distress in adolescents often manifests in subtle yet impactful ways, including irritability, fatigue, difficulty concentrating, and social withdrawal. These symptoms, if persistent, can evolve into more serious conditions such as clinical depression, generalized anxiety disorder, or self-injurious behaviors (3). A wide range of environmental, biological, and behavioral factors contribute to this distress, but contemporary research has increasingly focused on modifiable lifestyle habits. Poor dietary intake, especially low consumption of nutrient-dense foods and high intake of ultra-processed items, has been linked to the worsening of mood symptoms and cognitive functioning among youth (4, 5). Similarly, increasing sedentary behavior—particularly screen-based sedentary time—has been associated with a decline in adolescent mental well-being, disrupted sleep, and an increased risk of social and emotional difficulties (6, 7).

Nutrition plays a fundamental role in the neurodevelopment and emotional regulation of adolescents. Nutrients such as omega-3 fatty acids, B-vitamins, zinc, and iron are essential for optimal brain function, yet many adolescents fail to meet recommended dietary guidelines (4). Research indicates that unhealthy eating patterns, such as skipping meals or consuming high amounts of sugar-sweetened beverages, are significantly associated with emotional instability, fatigue, and heightened risk of depressive symptoms (8, 9). Dietary imbalances may lead to chronic inflammation and oxidative stress, both of which have been implicated in the pathophysiology of depression and anxiety (10). Moreover, adolescents facing body image issues may engage in disordered eating behaviors, further exacerbating their psychological vulnerability (5).

Beyond nutrition, sedentary behavior—defined as any waking behavior characterized by energy expenditure ≤1.5 METs while in a sitting or reclining posture—has emerged as another critical factor in adolescent mental health (11). Unlike physical inactivity, which refers to insufficient levels of moderate-to-vigorous physical activity, sedentary behavior includes prolonged screen use, gaming, and passive social media engagement. These behaviors have been associated with increased risks of anxiety, depression, and emotional dysregulation in adolescents, often through mechanisms such as social comparison, reduced physical movement, and disrupted circadian rhythms (12, 13). Adolescents who engage in extended sedentary activities are also more likely to experience sleep disturbances, which further compound psychological distress (6).

The relationship between sedentary time and psychological outcomes is particularly complex, given the nature of the activities involved. Mentally-passive sedentary behaviors such as watching television or scrolling through social media have been found to have more detrimental effects on mental health than mentally-active sedentary behaviors like reading or studying (14). Furthermore, screen-based sedentary behaviors may expose adolescents to cyberbullying, negative body image content, and unrealistic social norms, contributing to low self-esteem and psychological maladjustment (15, 16). Studies also suggest a dose-response relationship, where mental health risks increase with longer durations of sedentary activity (17).

Emerging evidence supports a multidimensional perspective on adolescent health, emphasizing the combined effects of various lifestyle factors on psychological well-being. For instance, a study found that

adolescents who maintained healthy nutrition habits, engaged in physical activity, and had low screen time reported better mental health profiles than those who only followed one or two of these behaviors (18). This interaction between behavioral domains suggests the need to study them not in isolation but as part of an integrated lifestyle approach (19). Nutrition and sedentary time, when co-occurring, may create cumulative or synergistic effects on psychological health. For example, adolescents who consume high-sugar snacks while watching television may be doubly vulnerable to emotional problems due to both dietary and behavioral risk exposure (8).

The COVID-19 pandemic has further highlighted the relevance of these lifestyle factors. Global lockdowns and remote learning protocols led to increased screen time, reduced physical activity, and disruptions in regular eating patterns among adolescents, coinciding with a notable uptick in reported mental health issues (20). While some studies report that sedentary time alone does not necessarily predict poor mental health, others emphasize the quality and context of these behaviors as key determinants (21). Adolescents who use screens for academic or creative activities may experience different psychological outcomes than those using them passively or for social comparison (22).

Despite growing research interest in the links between lifestyle and mental health, much of the literature has been fragmented, focusing either on sedentary behavior or dietary habits independently. There remains a paucity of studies examining the combined or interactive effects of nutrition habits and sedentary time on psychological distress, particularly in adolescent populations. Some longitudinal studies have begun to address these interactions, indicating that declines in physical activity and increases in sedentary behavior over time are associated with worsening mental health trajectories (23, 24). However, cross-sectional studies in diverse cultural settings remain essential for capturing population-specific risk patterns and informing localized intervention strategies.

In Turkey, adolescents are increasingly exposed to Westernized diets, screen-centered leisure activities, and academic stress—all of which may influence their psychological development. Recent reports have shown rising concerns regarding adolescent mental health in the Turkish context, yet few empirical studies have investigated how specific lifestyle habits contribute to these challenges. The lack of culturally contextualized data limits the ability of educators, clinicians, and policymakers to design effective youth-focused mental health programs. Therefore, it is crucial to investigate these behavioral correlates in Turkish adolescents to enhance understanding and prevention of psychological distress in this demographic.

This study aims to explore the effects of nutrition habits and sedentary time on psychological distress among adolescents in Turkey.

Methods and Materials

Study Design and Participants

This study employed a correlational descriptive design to examine the relationships between nutrition habits, sedentary time, and psychological distress in adolescents. A total of 424 participants were selected using stratified random sampling from secondary and high schools in Turkey. The sample size was determined based on the Morgan and Krejcie (1970) sample size table for a population greater than 10,000, ensuring sufficient statistical power for correlation and regression analyses. Inclusion criteria consisted of being an adolescent aged between 12 and 18 years, currently enrolled in school, and providing informed

consent (and parental consent where required). Data were collected using standardized self-report instruments administered during school hours under researcher supervision.

Data Collection

The Kessler Psychological Distress Scale (K10), developed by Kessler et al. in 2002, is a widely used self-report tool designed to measure non-specific psychological distress over the past four weeks. The scale consists of 10 items that assess symptoms of anxiety and depression, each rated on a 5-point Likert scale ranging from "None of the time" (1) to "All of the time" (5). The total score ranges from 10 to 50, with higher scores indicating greater levels of distress. The K10 has been validated across multiple populations and cultural contexts, including adolescent samples, and has demonstrated strong psychometric properties. Confirmatory factor analyses have supported its unidimensional structure, and studies consistently report high internal consistency (Cronbach's alpha values typically >0.85) and good test-retest reliability. Its brevity, ease of administration, and strong empirical support make it a suitable tool for assessing psychological distress in adolescent populations.

The Adolescent Food Habits Checklist (AFHC), developed by Johnson et al. in 2002, is a validated instrument used to assess healthy and unhealthy eating behaviors in adolescents. The AFHC contains 23 items covering dietary practices such as meal skipping, fruit and vegetable intake, and consumption of high-fat or sugary foods. Responses are dichotomous (Yes/No), with higher total scores indicating healthier eating habits. The AFHC does not use subscales but provides an overall score reflecting general nutrition behavior. This checklist has been validated in various adolescent samples and has shown good internal consistency (Cronbach's alpha values around 0.80). Its straightforward format and focus on behaviors relevant to youth nutrition make it appropriate for evaluating the dietary habits of adolescents in relation to psychological outcomes.

The Adolescent Sedentary Activity Questionnaire (ASAQ), developed by Hardy et al. in 2007, is a reliable and validated tool designed to assess sedentary behavior in adolescents. It includes 13 items measuring time spent on various sedentary activities such as watching television, using a computer, reading, and doing homework, reported separately for weekdays and weekends. Participants estimate time spent on each activity in hours and minutes, which is then aggregated to determine total sedentary time per day. The ASAQ has demonstrated good test-retest reliability (intraclass correlation coefficients >0.75) and has been validated against accelerometer data and other behavioral measures. Its comprehensive approach and suitability for self-administration make it an effective instrument for capturing the multifaceted nature of sedentary behavior in adolescent populations.

Data analysis

Data were analyzed using IBM SPSS Statistics version 27. Descriptive statistics including frequencies and percentages were used to summarize demographic variables. To examine the relationship between the dependent variable (psychological distress) and each independent variable (nutrition habits and sedentary time), Pearson's correlation coefficient was computed. Furthermore, a standard multiple linear regression analysis was performed to assess the combined predictive value of nutrition habits and sedentary time on

psychological distress. Prior to conducting the regression analysis, assumptions of normality, linearity, homoscedasticity, and absence of multicollinearity were tested and confirmed.

Findings and Results

The final sample consisted of 424 adolescents, of whom 230 (54.25%) were female and 194 (45.75%) were male. The participants ranged in age from 12 to 18 years, with the largest proportion being 15 years old (n = 97, 22.88%). A majority of the students (n = 289, 68.16%) reported living in urban areas, while 135 (31.84%) were from rural regions. Regarding parental education levels, 186 (43.87%) of fathers and 209 (49.29%) of mothers had completed at least high school. Most participants (n = 312, 73.58%) reported using digital devices for more than four hours a day.

Table 1. Descriptive Statistics for Main Study Variables (N = 424)

Variable	Mean (M)	Standard Deviation (SD)
Psychological Distress	27.48	7.62
Nutrition Habits	14.23	3.11
Sedentary Time (hrs)	6.89	2.46

Table 1 shows the descriptive statistics for the three primary variables in the study. The mean score for psychological distress was 27.48 (SD = 7.62), indicating a moderate level of distress among participants. Nutrition habits had a mean of 14.23 (SD = 3.11), suggesting moderate adherence to healthy eating behaviors based on the Adolescent Food Habits Checklist. The average sedentary time reported was 6.89 hours per day (SD = 2.46), indicating a relatively high level of screen-based inactivity among the adolescent sample.

Prior to conducting linear regression analysis, all relevant assumptions were assessed and met. Examination of skewness (−0.41) and kurtosis (−0.18) values indicated that the dependent variable (psychological distress) was approximately normally distributed. Linearity was confirmed through scatterplot inspection, showing a linear trend between the independent and dependent variables. Homoscedasticity was verified using the Breusch-Pagan test (χ^2 = 2.36, p = .124), indicating equal variance of residuals. Multicollinearity was not a concern, with tolerance values above 0.76 and Variance Inflation Factor (VIF) scores below 1.31 for both independent variables. The Durbin-Watson statistic was 1.94, confirming the independence of residuals.

Table 2. Pearson Correlation Coefficients Between Study Variables

Variables	1. Psychological Distress	2. Nutrition Habits	3. Sedentary Time
1. Psychological Distress	–		
2. Nutrition Habits	-0.41 (p < .01)	–	
3. Sedentary Time	0.47 (p < .01)	-0.36 (p < .01)	–

As shown in Table 2, psychological distress was significantly negatively correlated with nutrition habits (r = -0.41, p < .01), indicating that healthier eating was associated with lower distress levels. A significant positive correlation was found between psychological distress and sedentary time (r = 0.47, p < .01), showing that increased screen-based sedentary behavior was related to higher levels of psychological distress. Additionally, sedentary time was moderately negatively correlated with nutrition habits (r = -0.36, p < .01), suggesting an inverse relationship between healthy eating and screen use.

Table 3. Summary of Regression Analysis Predicting Psychological Distress

Source	Sum of Squares	df	Mean Square	R	R²	Adjusted R²	F	p
Regression	4021.65	2	2010.83	.55	.30	.29	86.48	< .001
Residual	9350.29	421	22.21					
Total	13371.94	423						

Table 3 presents the overall results of the linear regression analysis with psychological distress as the dependent variable and nutrition habits and sedentary time as independent predictors. The model was statistically significant ($F(2, 421) = 86.48$, $p < .001$), explaining approximately 30% of the variance in psychological distress ($R^2 = .30$, Adjusted $R^2 = .29$). The R value of .55 indicates a moderate effect size. These results suggest that the model provides a good fit for the data, with both predictors contributing significantly.

Table 4. Coefficients for Multiple Linear Regression Model Predicting Psychological Distress

Predictor	B	SE	β	t	p
Constant	35.29	1.73	−	20.39	< .001
Nutrition Habits	-0.91	0.15	-0.33	-6.07	< .001
Sedentary Time	1.23	0.18	0.39	6.83	< .001

Table 4 shows the detailed coefficients of the multiple regression analysis. Nutrition habits significantly predicted psychological distress ($B = -0.91$, $β = -0.33$, $t = -6.07$, $p < .001$), indicating that for each one-unit increase in healthy nutrition score, psychological distress decreased by 0.91 units. Similarly, sedentary time was a significant positive predictor ($B = 1.23$, $β = 0.39$, $t = 6.83$, $p < .001$), suggesting that for each additional hour of sedentary time, distress scores increased by 1.23 units. These results confirm that both lifestyle variables independently and significantly contribute to adolescents' psychological well-being.

Discussion and Conclusion

The present study explored the effects of nutrition habits and sedentary time on psychological distress in a sample of Turkish adolescents. Using Pearson correlation and multiple linear regression analyses, the results indicated a statistically significant negative relationship between healthy nutrition habits and psychological distress, as well as a positive relationship between sedentary time and psychological distress. Furthermore, both independent variables—nutrition habits and sedentary time—were significant predictors of psychological distress in the regression model, confirming their combined influence on adolescent mental health. These findings underscore the critical role of lifestyle behaviors in shaping the psychological well-being of adolescents and align with a growing body of international literature.

The negative association between healthy nutrition habits and psychological distress found in this study aligns with previous research emphasizing the mental health benefits of nutritious diets in adolescence. Adolescents who reported consuming balanced meals, rich in fruits, vegetables, whole grains, and low in processed foods, exhibited lower levels of emotional symptoms. This outcome resonates with findings by (4), who reported that poor dietary quality was associated with elevated risks of anxiety and depression in Korean adolescents. Similarly, (8) found that unhealthy dietary practices, such as excessive consumption of sugar-sweetened beverages, were closely linked to mental health symptoms. The underlying mechanism may involve nutrient deficiencies impairing neurotransmitter synthesis, hormonal regulation, and immune

function, all of which are implicated in the onset of psychological distress. Inflammation and oxidative stress—mediated by poor dietary choices—are increasingly recognized as biological pathways connecting diet to mental health outcomes (10).

The significant positive relationship between sedentary time and psychological distress further confirms existing concerns about the adverse impact of prolonged sitting behaviors on adolescent mental well-being. In this study, adolescents who reported higher levels of daily screen-based sedentary activity (e.g., watching videos, scrolling through social media, and gaming) also exhibited higher levels of psychological distress. This finding is consistent with research by (7), which highlighted the multifaceted psychological risks associated with sedentary screen time, including social isolation, low self-esteem, and disrupted sleep patterns. Similarly, (3) demonstrated a direct association between prolonged sedentary behavior and non-suicidal self-injury among adolescents, suggesting that excessive screen time may reflect or reinforce emotional dysregulation.

Other studies support the notion that the type and purpose of sedentary activity can moderate its mental health effects. For instance, (14) differentiated between mentally-passive and mentally-active sedentary behaviors, concluding that passive activities (like watching television or scrolling through social media) were more strongly associated with psychological distress than active ones (like reading or writing). The current study did not make such distinctions but contributes to the evidence base by reaffirming the general negative association between sedentary time and psychological health. Furthermore, research by (17) found that changes in sedentary behavior over time predicted increases in mental distress, highlighting the importance of ongoing behavioral monitoring and intervention.

When considered together, the regression model in this study showed that both nutrition habits and sedentary time independently and significantly contributed to explaining variations in psychological distress among adolescents. These results echo the findings of (18), who reported that combinations of physical activity, screen use, and sleep duration had a compounded effect on psychological and educational outcomes in adolescents. Likewise, (19) noted that 24-hour movement behaviors—including physical activity, sedentary behavior, and sleep—were all significantly associated with mental health indicators, suggesting the need for holistic health behavior interventions in this age group.

The COVID-19 pandemic has further accentuated the interplay between lifestyle factors and mental health in adolescents. A longitudinal study by (20) found that unfavorable changes in adolescent mental health during the pandemic were not necessarily explained by changes in physical activity or sedentary time alone, but rather by the complex interaction of multiple behavioral and contextual variables. Nonetheless, our findings are aligned with (6), who emphasized that increased sedentary time during and after the pandemic was associated with greater risks of sleep disturbances, which are strongly correlated with psychological distress.

An important contribution of this study lies in confirming the consistency of international findings in a Turkish adolescent population, a demographic underrepresented in current literature. In Turkey, Westernized eating patterns, increased academic pressure, and the proliferation of digital entertainment have reshaped adolescent lifestyles. The current study adds empirical weight to concerns raised by scholars like (21), who emphasized the multifactorial effects of lifestyle behaviors on brain development and mental health outcomes during adolescence. Additionally, (25) provided neuroscientific evidence of the cognitive

impairments associated with prolonged screen exposure, which may explain part of the psychological burden identified in our sample.

The results of this study also align with the literature linking lifestyle behaviors with specific mental health outcomes such as self-esteem, emotional resilience, and interpersonal functioning. For example, (5) highlighted how overcoming body shaming and cultivating self-esteem in adolescents was associated with improved dietary choices and reduced screen exposure. Moreover, (9) noted that adolescents who were more physically active and less sedentary exhibited better mood regulation and peer relationships.

Notably, (26) conducted a systematic review which concluded that combinations of physical activity, sedentary time, and sleep duration were associated with depressive symptoms and other mental health problems. Their findings are particularly relevant to the current study's multi-variable regression approach, which sought to understand how both nutrition and sedentary behavior jointly predict psychological distress. Furthermore, (2) confirmed that sedentary behavior and low physical activity levels were associated with generalized anxiety disorder in adolescents, reinforcing the psychological risks of passive lifestyles.

Although this study focused on dietary habits and sedentary time, other studies have explored the role of physical fitness and social environments. For instance, (24) and (23) provided evidence that sustained physical activity over time was protective against mental health problems in adolescence. The lack of a physical activity variable in the present study may limit its comprehensiveness but also draws focused attention to two crucial and modifiable behaviors—eating and screen use.

Additionally, the findings reflect the broader behavioral ecology of adolescence. Adolescents are influenced by school environments, family routines, and peer behaviors, which shape their access to healthy foods and determine their leisure-time activities. As (22) demonstrated, family-based interventions can be effective in reducing screen-based sedentary behavior, indicating that multi-layered approaches may be necessary to bring about meaningful change. Moreover, (16) reviewed how gadget addiction contributed to physical inactivity, reinforcing the current study's findings on the detrimental psychological impact of digital overexposure.

Finally, the association between screen time and bullying—highlighted by (15)—adds another layer of understanding to the emotional toll of sedentary behavior. Adolescents who spend more time online may be more exposed to peer conflict, cyberbullying, and toxic online interactions, which may further deteriorate their mental state. While the current study did not measure cyberbullying or social media exposure specifically, the strong correlation between sedentary time and psychological distress may partially reflect these digital stressors.

Despite its strengths, this study has several limitations. First, the cross-sectional design limits the ability to infer causality between lifestyle behaviors and psychological distress. Longitudinal studies are needed to determine whether poor nutrition and increased sedentary time lead to psychological symptoms or vice versa. Second, the data were collected through self-report questionnaires, which may be subject to recall bias and social desirability bias. Adolescents may have under- or over-reported their dietary habits and screen use. Third, the study did not account for other potential confounding variables such as sleep duration, physical activity levels, socioeconomic status, or academic stress, which could moderate the observed relationships. Finally, while the sample was adequate in size and drawn from multiple schools, it may not fully represent the diversity of adolescents across all regions of Turkey.

Future research should adopt longitudinal or experimental designs to better understand the directionality and causality of the relationships among nutrition, sedentary behavior, and psychological distress. Including additional variables such as sleep quality, peer relationships, physical activity levels, and family dietary environments would offer a more comprehensive view of adolescent lifestyle influences on mental health. Cross-cultural comparative studies could also reveal how cultural and social contexts moderate these associations. Moreover, qualitative investigations into adolescents' subjective experiences with eating and screen behaviors could provide deeper insights into underlying psychological processes.

To address the growing concern over adolescent mental health, schools should implement integrated health education programs that emphasize both healthy eating and the reduction of sedentary screen time. Health professionals working with adolescents should screen for poor dietary habits and excessive screen use as part of routine mental health assessments. Parents can be engaged through workshops or digital resources to encourage home environments that support nutritious meals and active pastimes. Finally, public health policies should promote youth-friendly environments that make healthy food accessible and provide safe, engaging alternatives to sedentary activities.

Acknowledgments

Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Written consent was obtained from all participants in the study.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

References

1.	Monika M, Majeed J, Sharma N. Psychological Well-Being of Adolescents. JRTDD. 2023. doi: 10.53555/jrtdd.v6i7s.2157.

2.	Chun SB, Lee M. The Relationship of Leisure-Time Sedentary Behavior, Physical Activity, and Generalized Anxiety Disorder Among Adolescents. Korean Soc Leisure Sci. 2023;14(1):225-34. doi: 10.37408/kjls.2023.14.1.225.

3.	Guo Y, Yin X, Xu J, Chen F, Zhang F, Liu Y, et al. The Relationship Between Sedentary Behavior and Non-Suicidal Self-Injury Behavior Among Adolescents in China. Frontiers in Psychiatry. 2024;15. doi: 10.3389/fpsyt.2024.1489707.

4.	Yoo H-N, Kim N. Factors Associated With Lifestyle Habits and Mental Health Problems in Korean Adolescents: The Korea National Health and Nutrition Examination Survey 2017–2018. International Journal of Environmental Research and Public Health. 2020;17(24):9418. doi: 10.3390/ijerph17249418.

5.	Ula BM, Azizah N. Transforming Self-Esteem in Indonesian Teens by Overcoming Body Shaming. Ijhsm. 2024;1(1). doi: 10.21070/ijhsm.v1i1.8.

6.	Zhang Y, Chen S, Wang C, Zhang X, Zou L, Chi X, et al. Does More Sedentary Time Associate With Higher Risks for Sleep Disorder Among Adolescents? A Pooled Analysis. Frontiers in Pediatrics. 2021;9. doi: 10.3389/fped.2021.603177.

7.	You C, Cui Y. Examining the Hazards of Sedentary Behavior: An Overview of the Risks of Screen-Based Sedentary Behavior. Theoretical and Natural Science. 2024;29(1):226-36. doi: 10.54254/2753-8818/29/20240801.

8.	Suk J. Combination of Sugar-Sweetened Beverage Consumption, Screen-Based Sedentary Time, and Sleep Duration and Their Association With South Korean Adolescents' Mental Health. Frontiers in Public Health. 2024;11. doi: 10.3389/fpubh.2023.1293505.

9.	Santacruz E, Duarte-Zoilan D, Benítez G, Sequera G, Cañete F. Patterns of Physical Activity and Sedentary Behaviors in Adolescents Aged 13 to 15 in Paraguay. Anales De La Facultad De Ciencias Médicas (Asunción). 2021;54(3):17-24. doi: 10.18004/anales/2021.054.03.17.

10.	Muniyappa RTM. The Role of Physical Fitness in Adolescent Mental Health. Ijcrt. 2024;14(4):50274-6. doi: 10.61359/2024050032.

11.	Król D, Nowiński M, Mazurkiewicz W, Sak J, Fus-Mazurkiewicz L. Impact of Sedentary Behaviour on the Development of Diseases in Children and Adolescents – A Review of the Literature. Environmental Medicine. 2024;27(1):28-31. doi: 10.26444/ms/181517.

12.	Adhikari B. Use of Screen Media and Mental Health: Effects on Adolescents and Pre-Adolescents. Journal of Nepal Medical Association. 2021;59(241):962-4. doi: 10.31729/jnma.5518.

13.	Tebar WR, Canhin DS, Colognesi LA, Ana Elisa von Ah M, Silva DT, Christófaro DGD. Body Dissatisfaction and Its Association With Domains of Physical Activity and of Sedentary Behavior in a Sample of 15,632 Adolescents. International Journal of Adolescent Medicine and Health. 2020;33(6):539-46. doi: 10.1515/ijamh-2019-0241.

14.	Werneck AO, Romanzini M, Silva DR, Oyeyemi AL, Bueno MR, Ronque ÊRV. Association of Mentally-Passive and Mentally-Active Sedentary Behaviors With Device-Measured Bouts and Breaks of Sedentary Time in Adolescents. Health Promotion Perspectives. 2021;11(1):109-14. doi: 10.34172/hpp.2021.14.

15.	Zapata-López JS, Tonguino-Rosero S, Méndez F. Sedentary Behavior and School Bullying in Adolescents: An Analysis Based on a National Survey in Colombia. Journal of School Health. 2023;94(8):727-35. doi: 10.1111/josh.13397.

16.	Yusuf RA, Syamsir MR, Silwanah AS. Kecanduan Gadget Dan Aktifitas Fisik Pada Remaja: Tinjauan Literatur. Media Ilmu Kesehatan. 2023;11(1):85-98. doi: 10.30989/mik.v11i1.651.

17.	Opdal IM, Morseth B, Handegård B-H, Lillevoll K, Nilsen W, Nielsen CS, et al. Is Change in Mental Distress Among Adolescents Predicted by Sedentary Behaviour or Screen Time? Results From the Longitudinal Population Study the Tromsø Study: Fit Futures. BMJ Open. 2020;10(2):e035549. doi: 10.1136/bmjopen-2019-035549.

18.	Wilhite K, Booker B, Huang BH, Antczak D, Corbett L, Parker PD, et al. 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. 2022;192(4):665-79. doi: 10.1093/aje/kwac212.

19.	Fairclough SJ, Clifford L, Brown DMY, Tyler R. Characteristics of 24-Hour Movement Behaviours and Their Associations With Mental Health in Children and Adolescents. Journal of Activity Sedentary and Sleep Behaviors. 2023;2(1). doi: 10.1186/s44167-023-00021-9.

20.	Nyberg G, Helgadóttir B, Kjellenberg K, Ekblom Ö. COVID-19 and Unfavorable Changes in Mental Health Unrelated to Changes in Physical Activity, Sedentary Time, and Health Behaviors Among Swedish Adolescents: A Longitudinal Study. Frontiers in Public Health. 2023;11. doi: 10.3389/fpubh.2023.1115789.

21.	Logan NE, Ward-Ritacco CL. The Developing Brain: Considering the Multifactorial Effects of Obesity, Physical Activity &Amp; Mental Wellbeing in Childhood and Adolescence. Children. 2022;9(12):1802. doi: 10.3390/children9121802.

22.   Perrino T, Brincks AM, Estrada Y, Messiah S, Prado G. Reducing Screen-Based Sedentary Behavior Among Overweight and Obese Hispanic Adolescents Through a Family-Based Intervention. Journal of Physical Activity and Health. 2022;19(7):509-17. doi: 10.1123/jpah.2022-0050.

23.   Argüelles DF, Sánchez-Oliva D, Estrada JA, Fernández-Río J. Longitudinal Associations Between Physical Activity and Mental Health in Adolescents. Ricyde Revista Internacional De Ciencias Del Deporte. 2023;19(71):16-28. doi: 10.5232/ricyde2023.07102.

24.   Jee H. Physical Activity Trajectories of Different Grade Levels of Male Adolescents in Association of Academic Performance and Mental Health. Journal of Exercise Rehabilitation. 2023;19(5):258-67. doi: 10.12965/jer.2346352.176.

25.   Lopes GCD. Screen, Brain and Behavior: Neuroscientific Evidence About the Negative Effects of Prolonged Use. South Florida Journal of Health. 2024;5(4):e4756. doi: 10.46981/sfjhv5n4-004.

26.   Sampasa-Kanyinga H, Colman I, Goldfield GS, Janssen I, Wang J, Podinic I, et al. Combinations of Physical Activity, Sedentary Time, and Sleep Duration and Their Associations With Depressive Symptoms and Other Mental Health Problems in Children and Adolescents: A Systematic Review. International Journal of Behavioral Nutrition and Physical Activity. 2020;17(1). doi: 10.1186/s12966-020-00976-x.