



A Systematic Review of The Association Between Sedentary Behavior and Mental Health in Adolescence

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Abstract

Today's technological advancements provide convenience in various fields such as work activities, lifestyle, leisure time utilization and modern medicine. However, these technological advances also indirectly affect the decline in physical activity in general. Sedentary behavior occurs in all age ranges from children to the elderly. Children and adolescents are relevant age groups for this behavior because at this age there are a real physical and mental changes. One of the health consequences of sedentary behavior is mental health problems. This systematic review followed the PRISMA reference and applied review tools to assess quality and identify articles. Articles were obtained by searching PubMed, Springer Link and Scopus databases. From the search results, 9 suitable articles were obtained. Inclusion criteria include adolescence aged 10-19 years old, a quantitative studies, adolescents in general good health were included in the study due to the possible confounding effects of chronic physical health conditions. The most important part was that the negative impact of symptoms associated with these disorders could be recognized. The 9 articles found that most adolescents experienced sedentary behavior and also health mental problem. The result of this study, 7/9 articles showed that the most common mental health was depression followed by anxiety. There is a relationship between sedentary behavior and mental health problems with the most common problem being depression

INTRODUCTION

The development of technology today provides convenience in various fields such as work activities, lifestyle, leisure time utilization and modern medicine. However, these technological advances also indirectly affect the decline in physical activity in general. The relatively recent development of the internet and its accessibility on mobile devices (mobile phones, tablets and others) adds a negative impact on physical activity known as sedentary behavior (sedentary

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lifestyle) (Woessner et al., 2021). Sedentary behavior refers to waking behavior characterized by energy expenditure ≤ 1.5 metabolic equivalents (METs), while in a sitting, lying, or reclining position (Stubbs et al., 2018). It is also referred to as a sedentary lifestyle outside of resting time that involves sitting activities such as driving, working, studying, playing games, watching movies or using a computer. Sedentary behavior occurs in all age ranges from children to the elderly.

Children and adolescents are age groups that are relevant to this behavior because at this age there are real physical and mental changes. Adolescence is a transitional period because there are many shocks and changes that are quite radical from the previous period, especially emotional intelligence. The tendency of adolescents will try various behaviors which are sometimes risky behaviors (Handayani et al., 2019).

Sedentary behavior directly impacts health problems, such as obesity, metabolic syndrome, and cardiovascular disease (R. W. Ferreira et al., 2016). In the United States, the prevalence of overweight and obesity “jumped” from $<50\%$ in the 1960s to nearly 80% today. The health consequences of obesity are enormous and include the onset of diabetes, hypertension and cardiovascular disease, mental and psychological conditions, and other chronic diseases (Soiza et al., 2018). Sedentary behavior is defined as waking behavior characterized by an energy expenditure of ≤ 1.5 metabolic equivalents (METs), while in a sitting, reclining, or lying position (Tremblay et al., 2017) and this behavior is considered one of the important risk factors for health by the World Health Organization (WHO) (Pa et al., 2021). This behavior can occur at almost all ages, one of which is adolescence. The teenage age in question is the age of middle school and high school age. Adolescent sedentary behavior is usually manifested by activities such as watching television, using cellphones, and reading, using computers, taking online classes, and playing video games. These behaviors have increased during the Covid-19 pandemic era and even persist today. Many studies have mentioned that there is an association between sedentary behavior and several health conditions such as fat accumulation, cardiovascular disease and Type 2 Diabetes Mellitus ((Carson, 2016). However, some studies suggest that sedentary behavior also impacts mental health (Asiamah, 2021). Although the relationship between sedentary behavior and emotions has been proven by several studies, the exact relationship is not yet known.

MATERIAL AND METHODS

This Systematic Literature Review (SLR) study used the PRISMA (Preferred Reporting Items for Systematic reviews and Meta Analyses) approach.

Inclusion and exclusion criteria

Inclusion criteria were used to identify all studies related to sedentary behavior and mental health in adolescents. Adolescents were defined as aged between 10-19 years. Adolescents in general good health were included in the study due to the possible confounding effects of chronic physical health conditions. The most important part was that the negative impact of symptoms associated with these disorders could be recognized.

Sedentary behavior is defined as waking behavior characterized by energy expenditure ≤ 1.5 metabolic equivalents (METs), while in a sitting, reclining, or lying position (Stubbs et al., 2018). These behaviors are also referred to as sedentary lifestyles that involve sitting activities such as driving, working, studying, playing games, watching movies or using computers (not for school). This includes the use of electronic devices for entertainment such as TV, games and computer use.

This study involved 1) Research articles not reviews, 2) Studies with adolescent populations, 3). There is a mental health measurement, 4). The presence of sedentary behavior or screen time, 5). Cross sectional, survey and longitudinal studies, 6). Articles published from January 2014. Studies that fall into the exclusion criteria include 1). Interventional/therapy studies, 2). Adult or adolescent population with certain chronic diseases

Search Strategy

Articles were searched through databases including PubMed, Scopus, Proquest and Springerlink to find articles that might be eligible for review The primary search terms included “*sedentary behavior*” AND “*mental health*” AND “*adolescence*”. Database specific adaptations were applied where necessary.

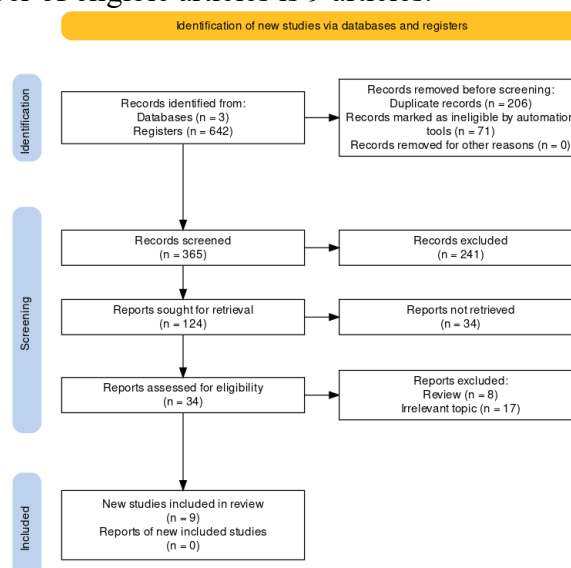
The initial search yielded 642 records, comprising 436 articles from PubMed, 127 from Scopus, and 79 from SpringerLink. Following the removal of 206 duplicate records, 436 unique articles remained for further screening. Titles and abstracts were then screened to assess relevance to the research question, resulting in 265 articles eligible for full-text review.

Study Selection Process

Full-text screening was conducted to evaluate methodological suitability and relevance based on the predefined eligibility criteria. During this phase, articles were excluded if they were review papers, did not include adolescent populations, lacked measures of sedentary behavior or mental health outcomes, or employed interventional designs. After full-text assessment, a total of nine studies met all inclusion criteria and were retained for final synthesis. The study selection process followed the PRISMA flow diagram and is presented accordingly

Data Extraction and Synthesis

Data extraction was independently performed by two members of the research team to reduce selection bias and enhance reliability. Extracted information included authorship, year of publication, study design, sample characteristics, measurement of sedentary behavior, mental health outcomes assessed, and key findings. From a total of 265 articles, the next step is screening the complete article screening, the articles obtained are not reviews and topic relevance, the last number of eligible articles is 9 articles.



RESULT

Summary of articles

This study involved 9 articles consisting of 1 article using survey method, 1 article using cohort method and 7 articles using cross sectional method. In detail the results of the articles consisting of the number of samples, methods and findings are listed in table 1. The types of mental health status that appear and types of sedentary behavior are listed in table 2.

Almost all studies involved adolescent respondents with ages ranging from 11-18 years. The overall study showed that the average health problem that arose was depression, then a small portion was anxiety, mood disorders and sleep disorders. The causes of sedentary behavior sedentary yang muncul The average screen time is either used for schoolwork or for playing, social media and other activities.

Table 1. Findings of survey and cross sectional studies

No	Author/Year	Title	Samples	Method	Findings
1	(Wang & Peiper, 2022)	Sedentary Behavior With Depressive Symptoms Association Between Physical Activity and Among US High School Students, 2019	13,526 adolescences in senior high school	Survey	Using a computer or digital device for 3 or more hours per day was associated with increased depressive symptoms (OR, 1.61; 95% CI, 1.41-1.85).
2	(Werneck et al., 2021)	Association of mentally-active and mentally-passive sedentary behaviour with depressive symptoms among adolescents	7.124 responcence	Kohort	In girls, sedentary behavior at age 11 years was associated with depressive symptoms later in life (14 years) [β : 0.089 (95%CI: 0.055-0.122), effect-value: 1.32]. This association was mediated by BMI [5.6% (95%CI: 4.1% - 8.6%)] and mentally passive sedentary behavior [105.6% (95%CI: 79.6% - 156.7%)]. No association was observed in boys or between mentally active sedentary behavior and later

No	Author/Year	Title	Samples	Method	Findings
					depressive symptoms.
3	(Mei et al., 2022)	Lifestyle Behaviors and Depressive Symptoms in Chinese Adolescents Using Regression and fsQCA Models	726 sampels	Metode crosssectional	Classroom learning and longer sleep duration (sedentary behavior and longer screen time) are associated with the appearance of depressive symptoms
4	(Lee & Kim, 2019)	Effect of university students' sedentary behavior on stress, anxiety, and depression	244 sampels	Cross sectional	Increased sedentary behavior increases stress, anxiety and depression in university students (Lee & Kim, 2019).
5	(Ellingson et al., 2018)	Changes in sedentary time are associated with changes in mental wellbeing over 1 year in young adults	271 sampels	Cross sectional	Reducing sedentary lifestyle time positively affects mental well-being. Results specifically showed a 60-minute reduction in sedentary lifestyle time can improve mental well-being.
6	(Jiang et al., 2020)	Association of Sedentary Behavior With Anxiety, Depression, and Suicide Ideation in College Students	28,298 sampels	Crosssectional	sedentary behavior and physical activity were significantly associated with mental illness. Sedentary behavior was positively associated with anxiety, depression, and suicidal behavior in a dose-dependent manner (AOR: 0.54-0.24; ≥ 7 hours/day as reference), independent of the effect of physical activity (AOR: 0.78-0.41; no physical activity as reference). The

No	Author/Year	Title	Samples	Method	Findings
					association between sedentary behavior and mental health was partially mediated by sleep quality (25-71%).
7	(Bélair et al., 2018)	Relationship between leisure time physical activity, sedentary behaviour and symptoms of depression and anxiety: Evidence from a population-based sample of Canadian adolescents	9702 sampels	Cross sectional	This study shows that physical inactivity is associated with an increased risk of depressive and anxiety symptoms among young people, while the relationship between sedentary behavior and depressive symptoms is less clear.
8	(V. R. Ferreira et al., 2020)	Physical inactivity during leisure and school time is associated with the presence of common mental disorders in adolescence	73,399 (12–17 years old)	Cross sectional	Physical inactivity during leisure time and school time is associated with the presence of mental disorders that are common in adolescence. The results showed that sports training, physical education at school, and physical activity during leisure time were associated with adolescents' mental health.
9	(Faria et al., 2022)	Time-use movement behaviors are associated with scores of depression/anxiety among adolescents: A compositional data analysis	217 (15-18 years old)	Cross sectional	Length of movement was significantly associated with depression/anxiety scores ($p < 0.05$).

Table 2. Summary of Mental health and sedentary behavior

	N	Mental Health				Sedentary Behavior				
		Depre si	Anxiet y	Low self estee m	Othe rs	Sree n time total	Video gamin g	T V	Compute r/ Internet	Othe rs
(Wang & Peiper, 2022)	13,526	√						√		
(Wernek et al., 2021)	7.124	√					√			
Mei et al., 2022)	726	√				√				
(Lee & Kim, 2019)	244	√							√	
(Ellingson et al., 2018)	271				√				√	
(Jiang et al., 2020)	28.298	√	√		√	√			√	
Bélairet al., 2018)	9.702	√	√			√				
V. R. Ferreira et al., 2020)	73.399				√				√	
Faria et al., 2022)	217	√	√						√	

DISCUSSION

Sedentary Behavior

Based on research, it shows that sedentary behavior that arises is due to the use of screen time both the use of television, cellphones, computers and other digital devices. Other behaviors that arise include internet / TV use, watching television, playing online games. Social media utilization has a relationship with sedentary behavior in adolescents. Currently, adolescents do a lot of sedentary behavior to linger on social media. In addition, information technology is used more by adolescents for things that are less useful, making students more often carry out activities with electronic media such as opening social media which is only for chatting online, sharing and viewing videos and photos of others, and not infrequently used to play games. This will become a bad habit that tends to eliminate the intention to do physical activity. The use of smartphones in adolescents cannot be limited by parents because the use of smartphones is used as an excuse for school needs such as studying or doing assignments. The convenience and sophistication of smartphones cause users including teenagers to be lazy to move, including exercising. One article states that an increase in the amount of digital device use for 3 hours or more will increase the appearance of depressive symptoms in adolescents.

The findings of this systematic review consistently demonstrate that sedentary behavior is significantly associated with poorer mental health outcomes, particularly depressive and anxiety symptoms, among adolescents and young adults. Evidence derived from large-scale cross-sectional studies as well as longitudinal designs suggests that both the duration and the qualitative nature of sedentary behavior play a critical role in shaping psychological well-being.

Screen-based sedentary behavior emerges as one of the most robust predictors of depressive symptoms. Wang and Peiper (2022) reported that adolescents who used computers or digital devices for three or more hours per day had a substantially higher likelihood of experiencing depressive symptoms. Similar patterns were observed in Chinese adolescents, where prolonged classroom-based sedentary activities and extended screen time were associated with increased depressive symptoms (Mei et al., 2022). These findings indicate that sedentary activities characterized by prolonged passive engagement may exert more detrimental effects on mental health than sedentary time alone.

Longitudinal evidence further strengthens this association. Werneck et al. (2021) showed that sedentary behavior in early adolescence predicted depressive symptoms later in life among girls, highlighting a critical developmental window during which behavioral patterns may have lasting mental health consequences. Importantly, this relationship was partially mediated by body mass index and mentally passive sedentary behaviors, suggesting that sedentary lifestyles may influence mental health through both physiological and behavioral pathways. The absence of a similar association among boys also underscores potential gender-specific vulnerabilities that warrant targeted prevention strategies.

Among university students and young adults, sedentary behavior has been consistently linked to stress, anxiety, and depression, independent of physical activity levels. Lee and Kim (2019) found that increased sedentary time was associated with higher psychological distress, while Jiang et al. (2020) demonstrated a clear dose–response relationship between sedentary behavior and mental health problems, including depressive symptoms and anxiety. Notably, these associations persisted after adjusting for physical activity, reinforcing the notion that sedentary behavior constitutes an independent risk factor. Furthermore, sleep quality was identified as a key mediator, accounting for a substantial proportion of the observed relationship, which highlights the complex interplay between movement behaviors, sleep, and mental health.

Conversely, reducing sedentary time appears to confer mental health benefits. Ellingson et al. (2018) reported that a daily reduction of 60 minutes in sedentary behavior was associated with improvements in mental well-being over a one-year period. This finding has important practical implications, suggesting that even modest behavioral changes may yield meaningful psychological benefits, particularly when sustained over time.

Nevertheless, not all studies reported uniformly strong associations. Bélair et al. (2018) observed that while physical inactivity was clearly linked to depressive and anxiety symptoms, the relationship between sedentary behavior and depression was less consistent. Such discrepancies may reflect differences in how sedentary behavior is measured, variations in the types of sedentary activities assessed, or contextual and cultural factors across study populations. Supporting this perspective, Ferreira et al. (2020) and Faria et al. (2022) emphasized the importance of considering movement behaviors as an integrated composition, wherein physical activity, sedentary time, and sleep collectively influence mental health outcomes.

Mental Health

The emotional problems that arise vary widely, from stress, anxiety, depression to suicidal ideation. As well as physical activity, there is a complex relationship between sedentary behavior, overweight/obesity, and related obesogenic risk behaviors, and these may have a significant negative impact on adolescent mental health. A total of 7/9 articles showed that the majority of the impact of sedentary behavior was depression followed by anxiety. Other mental health problems included mood disorders and sleep disorders. In one cohort study, it was stated that an adolescent girl at the age of 11 years who passively engaged in sedentary behavior was at risk of depression at the age of 14 years. β : 0.089 (95%CI: 0.055-0.122), e-value: 1.32. and there was no correlation in adolescent boys. Passive sedentary behaviors include watching TV/movies, and using the internet. The active sedentary behavior includes playing games and doing homework. According to (Bélair et al., 2018),

Both physical inactivity and physical activity appear to be significantly associated with symptoms of depression and anxiety. The odds of having moderate and severe depression and anxiety symptoms compared with no symptoms were 1.43 (1.11-1.84) and 1.88 (1.45-2.45) times higher, respectively, in physically inactive adolescents compared with physically active adolescents. The odds of having moderate and severe depression and anxiety symptoms compared to asymptomatic were 1.38 (1.13 -1.69) and 1.31 (1.02-1.69) times higher, respectively, in physically inactive adolescents compared to physically active adolescents.

The findings in question showed a significant association between sedentary behavior and changes in several aspects of mental well-being over one year in healthy young adults. Specifically, the article showed that changes in sitting time were positively associated with changes in several aspects of mood disorders, including depression, anger, fatigue, and confusion, as well as positively associated with changes in stress and negatively associated with changes in sleep duration. Thus, increased sitting time may put individuals at greater risk of experiencing a decline in mental well-being. Previous research suggests that prolonged sedentary behavior may be a better predictor of health outcomes than total sitting time.

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