



Analysis of Predisposing, Enabling, and Reinforcing Factors as Determinants of Sedentary Behavior Among Adolescents in Medan

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Abstract

Sedentary behavior among adolescents has emerged as an increasingly concerning public health issue, particularly in urban areas such as Medan City. This study aims to analyze the association between predisposing factors (gender, age, knowledge, attitude, motivation, and self-efficacy), enabling factors (facilities), and reinforcing factors (income and family support) and sedentary behavior

among adolescents. A cross-sectional study design with purposive sampling was used, involving 100 adolescent respondents aged 15-24 years. Data were collected using a structured questionnaire and analyzed using the chi-square test to identify the association between independent variables and sedentary behavior. The results of the analysis indicated that gender ($p=0.022$), knowledge ($p=0.002$), attitude ($p=0.026$), motivation ($p=0.037$), self-efficacy ($p=0.016$), facilities ($p=0.007$), and family support ($p=0.022$) were significantly related to sedentary behavior, whereas age ($p=0.098$) and income ($p=0.079$) showed no significant association. Promotive and preventive interventions should focus on enhancing health literacy, providing facilities that support physical activity, and involving families in shaping healthy habits among adolescents. A multisectoral approach based on schools and communities is recommended to sustainably reduce the prevalence of sedentary behavior.

Keywords: Adolescents, enabling, predisposing, reinforcing, sedentary behavior

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Introduction

Sedentary behavior is defined as any activity performed in a sitting, reclining, or lying position with an energy expenditure of 1.5 METs or less, excluding sleep time (Tremblay et al., 2017). Such low-energy activities, including sitting, watching television, using gadgets, or working at a computer, have now become one of the major determinants of public health problems in the 21st century, particularly among adolescents. The World Health Organization (WHO) recommends that children and adolescents aged 5–17 years engage in at least 60 minutes of moderate-to-vigorous physical activity per day and limit sedentary time, especially recreational screen time (WHO, 2020). However, studies indicate that 81% of adolescents (aged 11–17 years) worldwide still do not meet these recommendations (Guthold et al., 2020). In Indonesia, the proportion of the population with insufficient physical activity has also increased, from 33.5% in 2018 (Kemenkes RI, 2018) to 37.4% in 2023, including among adolescents (Kemenkes RI, 2023).

The increasing prevalence of sedentary behavior among adolescents has become a global concern, as it has been shown to contribute as a risk factor for various long-term health problems, including obesity, type 2 diabetes mellitus, cardiovascular diseases, metabolic disorders, and mental health issues (Barnett et al., 2018; Shawon et al., 2025). Low levels of physical activity among adolescents with sedentary lifestyles lead to reduced energy expenditure, resulting in an imbalance between caloric intake and energy utilization. This condition may trigger the accumulation of body fat and weight gain, thereby increasing susceptibility to obesity and the risk of other non-communicable diseases (Westerterp, 2018). The World Health Organization also emphasizes that physical inactivity is one of the major risk factors for mortality due to non-communicable diseases, with insufficiently active individuals having a 20–30% higher risk of death compared to those who are adequately active (WHO, 2024).

Adolescence is a developmental phase that is highly vulnerable to various internal and external influences, which can significantly shape health behaviors later in life. Biological, psychological, and social changes during this period affect how adolescents perceive themselves, make decisions, and respond to their environment (Patton et al., 2016). This vulnerability can be



explained through the Precede-Proceed model, which emphasizes the interaction among predisposing, enabling, and reinforcing factors. Predisposing factors, such as age, sex, knowledge, attitudes, motivation, and self-efficacy, form the foundation of behavioral tendencies. Enabling factors, including the availability of supportive facilities and resources, determine the extent to which healthy behaviors can be implemented. Meanwhile, reinforcing factors, such as family support and socio-economic conditions, exert a sustained influence that may either strengthen or weaken these behaviors (Green et al., 2022).

A number of studies have demonstrated that limited knowledge and negative attitudes toward physical activity, insufficient sports facilities, and a lack of family support contribute to the high tendency of adolescents to adopt a sedentary lifestyle (Fajanah, 2018; Alliott et al., 2022). In addition, intrinsic motivation and self-efficacy have been shown to be key factors in facilitating the transition from sedentary habits to more active behaviors (Fu et al., 2022; Syalfina et al., 2024). A systematic review further reported that older age, female gender, negative attitudes, low self-efficacy, and inadequate knowledge are the main predictors of increased sedentary behavior among adolescents (Stierlin et al., 2015). Thus, the combination of predisposing, enabling, and reinforcing factors renders adolescents a particularly vulnerable group to unhealthy behaviors, including sedentary lifestyles, especially within urban environments characterized by high exposure to digital technologies and limited spaces for physical activity (Guthold et al., 2020).

Medan, as the third-largest urban area in Indonesia, is characterized by rapid urbanization, high population density, and accelerated digital technology development, all of which potentially increase adolescents' tendency to engage in sedentary behaviors, such as gadget use and screen-based activities. The urban environment, with its relatively limited green open spaces and public facilities for physical activity, coupled with a shift in social interactions toward digital platforms, positions Medan as an important representation for understanding the challenges of adolescent health behaviors in Indonesian urban settings. Furthermore, national data indicate that the prevalence of insufficient physical activity in North Sumatra Province has risen significantly, from 33.7% in 2018 (Kemenkes RI, 2018) to 47.6% in 2023 (Kemenkes RI, 2023), reflecting a pressing



public health concern. Given Medan's substantial contribution to the province's total population, the health conditions of adolescents in this city play a pivotal role in shaping the overall public health profile of North Sumatra. Moreover, the city's socio-economic and cultural diversity allows this study to provide a more comprehensive understanding of the determinants of sedentary behavior among adolescents.

Based on the aforementioned background, this study aims to analyze the associations between predisposing, enabling, and reinforcing factors and sedentary behavior among adolescents in Medan City. The findings are expected to serve as the basis for school- and community-based interventions that are designed to be effective and contextually relevant, grounded in empirical evidence and tailored to local characteristics, in order to reduce the prevalence of sedentary behavior within this age group.

Methods

This study used an observational analytic design with a cross-sectional approach, aiming to analyze the associations between predisposing, enabling, and reinforcing factors and sedentary behavior among adolescents in Medan City. The research was conducted in five randomly selected sub-districts of Medan, from July to September 2025. The study population comprised all adolescents aged 15–24 years residing in Medan City. The sample size was calculated using Slovin's formula (Sugiyono, 2019), resulting in a total of 100 participants. Sampling was carried out using purposive sampling with the following inclusion criteria: adolescents classified as overweight (Body Mass Index or BMI ≥ 23 kg/m²) and willing to participate by signing informed consent. Exclusion criteria included having mental/psychiatric disorders and being unable to communicate effectively.

The dependent variable in this study was sedentary behavior, measured using the validated and reliable Sedentary Behavior Questionnaire (SBQ) (Vélez Álvarez et al., 2021). Independent variables consisted of predisposing factors (age, gender, knowledge, attitudes, motivation, and self-efficacy), enabling factors (availability of sports facilities and public spaces), and reinforcing



factors (income and family support). The instruments used to measure the independent variables included a structured questionnaire covering respondent characteristics, knowledge, attitudes, self-motivation, availability of facilities, and family support. Specifically, self-efficacy was measured using the General Self-Efficacy Scale (GSES), which has been tested for validity and reliability (Novrianto et al., 2019).

Data analysis was conducted in stages, beginning with univariate analysis to describe the frequency distribution and proportions of each variable, followed by bivariate analysis using the Chi-Square test with a 95% confidence level. Associations were considered statistically significant at $p < 0.05$.

Results

Based on the data collected from 100 adolescents in Medan City, the findings of this study are presented as follows.

Table 1. Respondent characteristics

Characteristics	n = 100	%
Age		
15–19 years	92	92.0
19–24 years	8	8.0
Gender		
Female	64	64.0
Male	36	36.0
Occupation		
Student	89	89.0
University student	11	11.0
Income		
None	88	88.0
< 3,000,000 IDR	12	12.0
BMI		
23–25 kg/m ²	39	39.0
>25 kg/m ²	61	61.0



Information presented in Table 1 indicates that the majority of respondents were adolescents aged 15–19 years (92%) and predominantly female (64%). Consistent with the age distribution, most of the adolescents in this study were students (89%) who reported having no income (88%). Furthermore, the findings also revealed that the majority of respondents were classified as obese, with a BMI greater than 25 kg/m² (61%), while the remaining participants were overweight (39%).

Table 2. Frequency distribution of respondents based on categories of sedentary behavior, knowledge, attitude, motivation, self-efficacy, facilities, and family support

Variables	n = 100	%
Sedentary behavior		
High	40	40.0
Low	60	60.0
Knowledge		
Good	41	41.0
Poor	59	59.0
Attitude		
Positive	30	30.0
Negative	70	70.0
Motivation		
High	33	33.0
Low	67	67.0
Self-efficacy		
High	42	42.0
Low	58	58.0
Facilities		
Good	39	39.0
Poor	61	61.0
Family support		
Positive	36	36.0
Negative	64	64.0

The findings presented in Table 2 indicate that the majority of respondents exhibited a high level of sedentary behavior (60%). Most respondents also demonstrated poor knowledge (59%) and negative attitudes (70%) toward physical activity. Furthermore, the majority of adolescents in this study reported low levels of motivation (67%) and self-efficacy (58%) related to engaging in physical activity. In terms of enabling factors, most adolescents experienced limited access to



facilities that support physical activity, whether at school, at home, or within community and public spaces (61%). The results further revealed that the majority of respondents received insufficient family support to engage in physical activity (64%).

Table 3. Results of bivariate analysis with chi-square test

Variables	Sedentary behavior				Total		p
	Low		High		n=100	%	
	n	%	n	%			
Age							
15–19 years	39	42.4	53	57.6	92	100	0.098
19–24 years	1	12.5	7	87.5	8	100	
Gender							
Female	31	48.4	33	51.6	64	100	0.022*
Male	9	25.0	27	75.0	36	100	
Knowledge							
Poor	16	27.1	43	72.9	59	100	0.002*
Good	24	58.5	17	41.5	41	100	
Attitude							
Negative	33	47.1	37	52.9	70	100	0.026*
Positive	7	23.3	23	76.7	30	100	
Motivation							
Low	22	32.8	45	67.2	67	100	0.037*
High	18	54.5	15	45.5	33	100	
Self-efficacy							
Low	29	50.0	29	50.0	58	100	0.016*
High	11	26.2	31	73.8	42	100	
Facilities							
Poor	18	29.5	43	70.5	61	100	0.007*
Good	22	56.4	17	43.6	39	100	
Income							
None	38	43.2	50	56.8	88	100	0.079
< 3,000,000 IDR	2	16.7	10	83.3	12	100	
Dukungan keluarga							
Negative	31	48.4	33	51.6	64	100	0.022*
Positive	9	25.0	27	75.0	36	100	

*p-value<0.05

Based on the results of the bivariate analysis using the Chi-Square test, it was found that among the predisposing factors, gender (p=0.022), knowledge (p=0.002), attitude (p=0.026), motivation (p=0.037), and self-efficacy (p=0.016) were significantly associated with sedentary



behavior among adolescents, whereas age ($p=0.098$) was not significantly associated with sedentary behavior. The enabling factor, facilities, showed a p -value <0.05 , indicating a significant association with sedentary behavior among adolescents ($p=0.007$). Meanwhile, among the reinforcing factors, family support was significantly associated with sedentary behavior ($p=0.022$), while income did not show a significant association with sedentary behavior among adolescents.

Discussion

The findings of this study indicate that the factors significantly associated with sedentary behavior among adolescents in Medan City include gender, knowledge, attitude, motivation, self-efficacy, facilities, and family support, whereas age and income were not significantly associated. These results can be further analyzed within the framework of the Precede-Proceed model, which categorizes the determinants of health behavior into three main domains: predisposing, enabling, and reinforcing factors (Green et al., 2022).

Predisposing Factors

Age, gender, knowledge, attitude, motivation, and self-efficacy are categorized as predisposing factors, namely individual characteristics that influence the tendency to engage in certain behaviors. In this study, gender was found to be significantly associated with sedentary behavior. This finding is consistent with a systematic review which reported that female adolescents tend to have higher sedentary time compared to males, primarily due to a preference for screen-based activities and lower participation in physical exercise (Stierlin et al., 2015). Similarly, Fajanah (2018) also reported that female adolescents are at greater risk of engaging in high levels of sedentary behavior. Guthold et al. (2020) further highlighted that, at the global level, female adolescents generally exhibit lower levels of physical activity.

In addition, knowledge and attitude were also found to be significantly associated with sedentary behavior. Adolescents with adequate knowledge of the negative impacts of sedentary lifestyles tend to develop positive attitudes toward physical activity, thereby being more capable of reducing sedentary time. A study conducted by Krisnawati et al. (2024) identified a relationship



between knowledge and healthy lifestyles among adolescents, including the reduction of sedentary behavior. Meanwhile, Martins et al. (2015), in a systematic review, highlighted that negative attitudes toward physical activity constitute one of the barriers preventing adolescents from engaging in physical exercise. These findings underscore that knowledge and attitude are important predisposing factors that can influence adolescents' behavioral choices.

Furthermore, motivation and self-efficacy were also found to be associated with sedentary behavior. Adolescents with higher levels of motivation and stronger self-efficacy were more likely to be physically active and to limit sedentary behavior. This finding is supported by Syalfina et al. (2024), who reported a positive association between self-motivation and physical activity among adolescents. Similarly, a study conducted by Szczuka et al. (2021) demonstrated that higher self-efficacy was associated with lower levels of sedentary behavior in adolescents. Self-efficacy is considered a strong predictor of health behavior change in adolescence, as individuals with greater confidence in their abilities are more likely to avoid sedentary lifestyles.

However, age was not found to be significantly associated with sedentary behavior in this study. This finding contrasts with several previous studies that reported older adolescents were more likely to engage in sedentary behavior (Stierlin et al., 2015; Nafi'ah & Hadi, 2022). A possible explanation for this discrepancy is the relative homogeneity of age within the adolescent group studied, which limited the variability needed to demonstrate meaningful differences.

Enabling Factors

Facilities are categorized as enabling factors, referring to environmental conditions that allow or facilitate the adoption of healthy behaviors. The availability of sports facilities, green open spaces, and access to public amenities that support physical activity has been shown to be significantly associated with lower levels of sedentary behavior. Adolescents with access to sports facilities, green spaces, or recreational amenities tend to exhibit lower sedentary levels. Sujarwati et al. (2023) reported that the physical environment, including the availability of sports facilities, is an important determinant influencing physical activity and sedentary behavior among adolescents. Similarly, Alliott et al. (2022) emphasized that limited access to facilities constitutes



one of the main barriers to increasing physical activity and reducing sedentary behavior in this age group. These findings are consistent with the principles of health ecology, which highlight the importance of environment-based interventions in shaping population-level behavior change.

Reinforcing Factors

Family support is classified as a reinforcing factor, namely a social element that strengthens or sustains health behaviors. Support from parents or other family members has been shown to be significantly associated with encouraging adolescents to be more physically active and to reduce unproductive sitting time. Adolescents who receive parental support—whether in the form of verbal encouragement, role modeling, or the provision of facilities—are more likely to adopt active behaviors and limit sedentary time. This finding is consistent with the study by Yusuf et al. (2021), which reported that parental and peer support were positively correlated with increased physical activity among adolescents. Similarly, Sujarwati et al. (2023) demonstrated that social support, including that provided by family, is one of the factors influencing adolescents' physical activity behaviors.

Conversely, income was not found to be significantly associated with sedentary behavior. This result suggests that economic factors are not always the primary determinants, particularly in urban contexts such as Medan, where access to technology (e.g., gadgets) as well as sports facilities can be found across different socioeconomic strata. A systematic review and meta-analysis conducted by Mielke et al. (2017) also reported that while some socioeconomic indicators were associated with sedentary behavior, other studies did not identify a consistent pattern. This indicates that economic status does not necessarily correlate directly with physical activity, but is more strongly influenced by psychosocial and environmental factors.

Conclusion and Recommendation

This study suggests that sedentary behavior among adolescents in Medan City is significantly associated with predisposing factors (gender, knowledge, attitude, motivation, and self-efficacy), enabling factors (availability of facilities), and reinforcing factors (family support).



In contrast, age and family income were not found to have a statistically significant association with sedentary behavior. These findings emphasize that adolescent health behaviors are not solely determined by demographic characteristics but are also shaped by the complex interplay of psychosocial and environmental factors.

Based on the findings of this study, it is recommended that interventions to reduce sedentary behavior among adolescents focus on strengthening predisposing factors through health education that fosters knowledge, positive attitudes, motivation, and self-efficacy toward physical activity. In addition, local governments and educational institutions should enhance access to and the quality of facilities that support physical activity as enabling factors, while also encouraging active family involvement in promoting healthy lifestyles among adolescents as reinforcing factors. A multisectoral approach that integrates individual, environmental, and social dimensions is essential to establish sustainable active behaviors.



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