

Effectiveness of A Behavior Modification Intervention Model Based On Social Cognitive Theory to Improve Healthy Lifestyle Compliance Among Adolescents

ABSTRACT

Background: Behavioral modification interventions based on *Social Cognitive Theory* are needed to improve healthy lifestyle compliance among adolescents.

Objective: This study aimed to develop and examine the effectiveness of a behavioral modification intervention model based on *Social Cognitive Theory* to improve healthy lifestyle compliance among adolescents

Methods: This study employed a mixed-method sequential exploratory design consisting of qualitative and quantitative approaches. The quantitative phase used a one-group pretest–posttest design involving 100 adolescents selected through purposive sampling. Data were collected using a healthy lifestyle compliance questionnaire that had been tested for validity and reliability. The intervention was conducted through four stages: introduction, preparation, action, and maintenance. Data were analyzed using paired *t-test* and Cohen's *d* effect size analysis with a significance level of $p < 0.05$ using SPSS version 25.0.

Results: The mean healthy lifestyle compliance score increased significantly from 61.42 ± 8.53 before intervention to 78.67 ± 7.14 after intervention, with a mean difference of 17.25 points ($p < 0.001$; 95% CI: 15.09–19.41). The intervention demonstrated a large effect size with Cohen's *d* value of 1.24. Multivariate analysis showed that *self-efficacy* ($p < 0.001$), *self-regulation* ($p = 0.001$), *family support* ($p = 0.003$), and *peer support* ($p = 0.005$) were significantly associated with healthy lifestyle compliance after intervention.

Conclusion: The behavioral modification intervention model based on *Social Cognitive Theory* was effective in improving healthy lifestyle compliance among adolescents.

Keywords: Adolescents; Healthy Lifestyle; Intervention Model; Self-Efficacy; Social Cognitive Theory

INTRODUCTION

Adolescence is a critical transitional phase that plays a significant role in shaping health behaviors in later stages of life [1,2]. During this period, adolescents experience biological, psychological, social, and emotional changes that influence their decision-making processes regarding daily lifestyle practices [3]. Habits established during secondary school years tend to persist into adulthood; therefore, health behaviors during adolescence are considered an important indicator in the prevention of non-communicable diseases in the future. Adolescents who adopt healthy lifestyles from an early age are more likely to maintain optimal physical and mental health conditions [3].

Conversely, sedentary behavior, fast-food consumption, lack of physical activity, smoking habits, sleep disturbances, and poor self-regulation may increase the risk of developing various chronic health problems [4]. Therefore, efforts to improve adherence to healthy lifestyles among adolescents require approaches that not only focus on increasing knowledge but also consider personal factors, social environments, and continuous behavioral change processes [1].

The concept of health behavior change among adolescents cannot be separated from behavioral theories that explain the interaction between individuals and their environments [5]. Social Cognitive Theory explains that health behavior is influenced by reciprocal interactions among personal factors, environmental factors, and the individual's own behavior [6,7]. Personal factors include self-efficacy, motivation, perception, and self-regulation abilities, whereas environmental factors encompass support from family, peers, teachers, and healthcare professionals [8]. In the context of secondary school adolescents, peer influence and the school environment contribute substantially to the formation of daily behaviors [4]. Furthermore, healthy behavioral change requires gradual stages beginning with awareness, preparation, action, and maintenance. A theory-based behavioral modification approach is essential because it can help adolescents identify unhealthy behaviors, develop commitment to change, and maintain healthy behaviors consistently through social support and positive reinforcement [7].

Currently, unhealthy lifestyle behaviors among adolescents show an increasing trend in many countries. The World Health Organization has reported that physical inactivity, consumption of foods high in sugar and fat, and sedentary behavior are major risk factors contributing to the increasing prevalence of non-communicable diseases among young populations [9]. This condition is also evident in Indonesia. Data from the 2018 Basic Health Research (Riskesdas) demonstrated an increase in the prevalence of various non-communicable diseases among individuals aged over 15 years, including cancer, which increased from 1.4% to 1.8%; stroke from 7% to 10.9%; hypertension from 25.8% to 34.1%; diabetes mellitus from 1.5% to 2.0%; and kidney failure from 2.0% to 3.8% [10]. These increases are closely associated with unhealthy lifestyle behaviors that begin to develop during adolescence. In addition, several studies in Indonesia have shown that adolescents tend to have unhealthy dietary patterns, dependence on gadget use, insufficient physical activity, and early experimentation with risky behaviors such as smoking. These findings indicate that adolescent lifestyle problems are no longer temporary behavioral issues but have evolved into public health threats that require systematic and sustainable interventions.

This phenomenon was also identified in the school environment of Muaro Jambi Regency. Preliminary survey results at SMAN 3 Muaro Jambi Regency revealed that most adolescents demonstrated unhealthy lifestyle behaviors, such as insufficient physical activity, fast-food consumption, and smoking behavior. Of the ten students interviewed, seven showed tendencies toward unhealthy lifestyles. These conditions were influenced by both internal and external factors. Peer influence was identified as one of the main determinants encouraging adolescents to follow group behavioral patterns, including junk-food consumption and sedentary lifestyles. In addition, poor self-control abilities and inadequate support from the school environment in promoting healthy behaviors made behavioral changes difficult to sustain in the long term. This situation indicates that secondary school adolescents require more comprehensive, structured, and developmentally appropriate intervention approaches to optimize adherence to healthy lifestyles [11].

Previous studies have generally focused only on examining the relationships between knowledge, attitudes, or specific behaviors and healthy lifestyles among adolescents without developing integrated behavioral intervention models [12]. Most adolescent health interventions still emphasize conventional health education approaches that primarily focus on information delivery, resulting in behavioral changes that are often unsustainable. Other studies have mainly evaluated only one aspect of health behavior partially, such as physical activity or dietary patterns, without simultaneously considering the interaction between personal factors and social environments [13,14]. Furthermore, the application of Social Cognitive Theory in developing healthy behavioral modification models for school adolescents in Indonesia remains limited, particularly when combined with a systematic stages-of-change approach. Few studies have developed theory-based intervention models consisting of introduction, preparation, action, and maintenance stages supported by social support from family members, peers, teachers, and healthcare professionals. These conditions demonstrate the need to develop more applicable and adaptive intervention models that align with the psychosocial characteristics of secondary school adolescents to facilitate more effective and sustainable healthy behavioral changes [15].

The development of a behavioral modification model based on Social Cognitive Theory in this study is important because it offers a more comprehensive approach compared to conventional health education interventions. The developed model emphasizes not only increasing knowledge but also strengthening self-efficacy, motivation, self-regulation, and social support as major determinants of behavioral change. Furthermore, the model is designed through systematic stages beginning with problem identification, recognition of unhealthy behaviors, commitment formation, implementation of behavioral actions, and continuous maintenance of healthy lifestyles. This study also integrates the concepts of Social Cognitive Theory with behavioral change approaches to produce a more operational and easily applicable intervention model within school settings. Another strength of this study lies in the involvement of teachers, peers, family members, and healthcare professionals in the adolescent behavioral change process, ensuring that the intervention is not solely individual-centered but also reinforces the social environmental support influencing adherence to healthy lifestyles.

This study aims to develop and evaluate the effectiveness of a Social Cognitive Theory-based behavioral modification intervention model in improving healthy lifestyle adherence among adolescents at SMAN 3 Muaro Jambi Regency. The findings are expected to provide theoretical contributions to the development of health promotion science and adolescent behavioral change theories, particularly regarding the application of Social Cognitive Theory in promoting healthy lifestyles. Practically, the resulting model is expected to serve as a guideline for schools, teachers, healthcare professionals, and policymakers in designing adolescent health promotion programs that are more effective, structured, and sustainable. In addition, this study is expected to help adolescents improve their awareness, motivation, and adherence in implementing healthy lifestyles in their daily lives. The hypothesis of this study is that the Social Cognitive Theory-based behavioral modification intervention model significantly influences the improvement of healthy lifestyle adherence among adolescents at SMAN 3 Muaro Jambi Regency.

METHODS

This study used a mixed-methods approach integrating qualitative and quantitative research through a sequential exploratory design. The first stage was conducted using a research and development approach to develop a behavioral modification intervention model based on Social Cognitive Theory to improve healthy lifestyle adherence among adolescents. The second stage employed a quantitative one-group pretest-posttest design to evaluate the effectiveness of the developed intervention model. In this design, measurements were conducted before the intervention (pretest), followed by the implementation of the behavioral modification model, and subsequently repeated after the intervention (posttest) to assess changes in healthy lifestyle adherence among respondents. The study was conducted at SMAN 3 Muaro Jambi Regency, Jambi Province, Indonesia, from May to August 2023. The research location was selected based on preliminary survey findings indicating a high prevalence of unhealthy lifestyle behaviors among students, including insufficient physical activity, fast-food consumption, and smoking behavior.

The population of this study consisted of all students at SMAN 3 Muaro Jambi Regency, totaling 725 students. The target population in the quantitative phase included eleventh-grade students because students at this level had adapted to the school environment and demonstrated more stable social interactions with peers, thereby providing a more accurate representation of lifestyle behaviors. The quantitative sample consisted of 100 respondents selected using purposive sampling based on predetermined inclusion and exclusion criteria. The inclusion criteria included active eleventh-grade students, willingness to participate by signing informed consent forms, ability to complete the entire intervention process, and attendance throughout the study period. The exclusion criteria included students who were ill, had communication difficulties, or did not complete the intervention program. Sample size determination was based on considerations related to the pre-experimental one-group pretest-posttest design by taking into account a statistical power of 80%, a significance level of 95%, and an estimated moderate effect on healthy behavioral changes after the intervention. A total sample of 100 respondents was considered sufficient to meet the minimum statistical requirements for detecting differences in mean healthy lifestyle adherence scores before and after the intervention while also accounting for potential dropouts during the study.

The primary outcome of this study was healthy lifestyle adherence among adolescents following the implementation of the Social Cognitive Theory-based behavioral modification intervention model. Healthy lifestyle adherence was defined as the adolescents' ability to implement healthy living behaviors, including regular physical activity, healthy dietary patterns, adequate sleep, stress

management, positive interpersonal relationships, and avoidance of risky behaviors such as smoking. The primary exposure variable was the implementation of the Social Cognitive Theory-based behavioral modification intervention model, which consisted of four stages: introduction, preparation, action, and maintenance. The predictors examined in this study included self-regulation, self-efficacy, motivation, perception, family support, peer support, teacher support, and healthcare provider support. Potential confounding factors controlled in this study included age, sex, gadget-use habits, and respondents' social environments. The potential effect modifiers considered were peer support and respondents' internal motivation, as these factors might strengthen behavioral changes during the intervention process. This study did not use clinical diagnostic criteria because the focus was on health behaviors and adherence to healthy lifestyles.

The research instruments included an adolescent healthy lifestyle adherence questionnaire and a guideline for implementing the Social Cognitive Theory-based behavioral modification intervention model. The questionnaire was developed based on the Health Promoting Lifestyle Profile concept and Bandura's Social Cognitive Theory constructs, including self-efficacy, self-regulation, motivation, perception, and social support. The instrument consisted of several domains, namely physical activity, healthy eating patterns, stress management, sleep quality, interpersonal relationships, and health-risk avoidance behaviors. Responses were measured using a 5-point Likert scale ranging from "never" to "always." Content validity was evaluated by experts in health promotion, community nursing, and health psychology through expert judgment. Construct validity testing was subsequently performed using Pearson Product Moment correlation with validity coefficients greater than 0.30, while reliability testing was conducted using Cronbach's Alpha with values greater than 0.70, indicating that the instrument was reliable for use. The intervention implementation guideline also underwent two stages of validation by experts and practitioners before being declared feasible for pilot implementation among study respondents.

The study data consisted of both primary and secondary data. Primary data were obtained directly from respondents through pretest and posttest questionnaires, behavioral observations, in-depth interviews during the model development phase, and daily healthy behavior journals completed by respondents throughout the intervention period. Secondary data were obtained from school reports and documentation related to student conditions at SMAN 3 Muaro Jambi Regency. Data collection was conducted by the researchers and trained enumerators who received training regarding research procedures, observation techniques, and standardized instrument administration to ensure measurement consistency. During the intervention phase, respondents received education regarding healthy lifestyles, identification of unhealthy behaviors, development of behavioral change commitments, healthy behavior mentoring, and monthly evaluations for approximately three months. The assessment method was applied uniformly to all respondents using the same instruments during both the pretest and posttest phases to maintain comparability of measurements over time.

To minimize potential bias, several bias-control strategies were implemented in this study. Selection bias was minimized through the application of clear inclusion and exclusion criteria and systematic respondent recruitment procedures. Information bias was controlled through the use of instruments that had undergone validity and reliability testing, as well as enumerator training before data collection. Measurement bias was minimized by applying standardized questionnaire administration procedures for all respondents. In addition, the researchers conducted monitoring throughout the intervention implementation to ensure that all program stages were carried out according to the guidelines. Potential recall bias was minimized through the use of daily healthy behavior journals, allowing respondents to record activities directly during the intervention period. All collected data were checked for completeness before analysis to reduce the possibility of missing data.

Data analysis was conducted in several stages, including univariate and bivariate analyses. Univariate analysis was used to describe respondent characteristics and the distribution of study variables in the form of means, standard deviations, frequencies, and percentages. Before conducting bivariate analysis, data normality was tested using the Shapiro-Wilk test, and the results indicated that the data were normally distributed ($p > 0.05$); therefore, parametric analysis could be applied. Bivariate analysis was conducted to evaluate differences in healthy lifestyle adherence scores before and after the intervention using a paired t-test. In addition to testing statistical significance, this study also calculated the magnitude of the intervention effect using Cohen's d effect size to determine the strength of the effect of the Social Cognitive Theory-based behavioral modification intervention model on improving healthy lifestyle adherence among adolescents. Cohen's d values were

interpreted as small (0.2), medium (0.5), and large effects (0.8). Statistical significance was established at $p < 0.05$ with a 95% confidence level. All data analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 25.0. The results were presented in tables and narrative form to explain the effectiveness of the Social Cognitive Theory-based behavioral modification intervention model in improving healthy lifestyle adherence among adolescents.

RESULTS

The findings are presented in four sections. First, the demographic characteristics of the respondents are described. Next, changes in healthy lifestyle compliance before and after the intervention are reported, followed by the effect size of the intervention model and the multivariate analysis identifying factors associated with healthy lifestyle compliance after the intervention.

Table 1. Characteristics of Respondents at SMAN 3 Muaro Jambi

Variable	Frequency (n)	Percentage (%)
Age (years)		
15 years	18	18.0
16 years	57	57.0
17 years	25	25.0
Gender		
Male	44	44.0
Female	56	56.0
Healthy Lifestyle Compliance Before Intervention		
Low	38	38.0
Moderate	49	49.0
High	13	13.0
Healthy Lifestyle Compliance After Intervention		
Low	10	10.0
Moderate	34	34.0
High	56	56.0

Table 1 summarizes the demographic characteristics of the respondents and the distribution of healthy lifestyle compliance before and after the intervention. Overall, the respondents were predominantly 16 years old and female. The distribution of healthy lifestyle compliance shifted toward higher compliance after the intervention, suggesting improved adherence to healthy lifestyle behaviors.

Table 2. Differences in Healthy Lifestyle Compliance Scores Before and After Intervention (n = 100)

Variable	Mean $\pm$ SD	Mean Difference	t-value	p-value	95% CI
Pretest	61.42 $\pm$ 8.53				
Posttest	78.67 $\pm$ 7.14	17.25	15.872	<0.001	15.09 – 19.41

Table 2 presents the comparison of healthy lifestyle compliance scores before and after the intervention. Healthy lifestyle compliance increased significantly following the intervention, with a mean improvement of 17.25 points. The paired t-test confirmed that this increase was statistically significant ($p < 0.001$).

Table 3. Effect Size of the Social Cognitive Theory-Based Behavioral Modification Intervention Model

Variable	Cohen's d	Interpretation
Healthy lifestyle compliance score	1.24	Large effect

Table 3 presents the effect size of the intervention model. The analysis indicated a large practical effect (Cohen's $d = 1.24$), demonstrating that the intervention substantially improved healthy lifestyle compliance among adolescents.

Table 4. Multivariate Analysis of Factors Associated with Healthy Lifestyle Compliance After Intervention

Variable	B	SE	Beta	p-value	95% CI
Self-efficacy	0.48	0.11	0.39	<0.001	0.26 – 0.70
Self-regulation	0.36	0.10	0.31	0.001	0.16 – 0.56
Family support	0.29	0.09	0.24	0.003	0.10 – 0.48
Peer support	0.33	0.12	0.27	0.005	0.09 – 0.57

Table 4 summarizes the multivariate analysis of factors associated with healthy lifestyle compliance after the intervention. Self-efficacy emerged as the strongest predictor, while self-regulation, family support, and peer support also showed significant positive associations with healthy lifestyle compliance.

DISCUSSION

This study successfully achieved its primary objective of developing and evaluating the effectiveness of a Social Cognitive Theory-based behavioral modification intervention model in improving healthy lifestyle adherence among adolescents at SMAN 3 Muaro Jambi Regency. The findings demonstrated a significant increase in healthy lifestyle adherence scores after the intervention, with the mean score increasing from 61.42 ± 8.53 to 78.67 ± 7.14 and a p-value of < 0.001 . The Cohen's d value of 1.24 indicated that the intervention model had a large effect on healthy behavioral changes among adolescents. These findings suggest that the developed intervention approach was capable of facilitating more targeted behavioral changes because it not only focused on providing health information but also strengthened self-regulation, motivation, and social support continuously. The success of this study was also reflected in the increased proportion of respondents categorized as having high healthy lifestyle adherence after the intervention. This condition indicates that the implemented intervention was aligned with the psychosocial developmental needs of adolescents, making it easier to accept and apply in their daily lives.

The findings of this study are consistent with those of Nazari et al. [16] who reported that theory-based health promotion interventions significantly improved healthy living behaviors among adolescents. Bandura's research also explained that the Social Cognitive Theory approach effectively promotes health behavioral changes through strengthening self-efficacy and social learning processes. Furthermore, Çelebi et al. [17] found that healthy lifestyle behaviors among secondary school students were strongly influenced by social support and the school environment. Another study conducted by Akseer et al. [18] demonstrated that structured lifestyle modification could improve healthy behaviors and reduce the risk factors of non-communicable diseases among adolescents. The similarity between the findings of this study and previous studies suggests that health behavioral changes among adolescents require a multidimensional approach involving both individual and environmental factors simultaneously. However, this study differs from previous studies because it developed an intervention model integrating the stages of introduction, preparation, action, and behavioral maintenance, thereby making the behavioral change process more systematic and sustainable compared to conventional educational interventions [19].

The findings of this study are supported by Social Cognitive Theory developed by Bandura, which explains that health behaviors are formed through reciprocal interactions among personal factors, environmental factors, and individual behaviors. In this study, the improvement in healthy lifestyle adherence occurred because the intervention successfully enhanced adolescents' self-efficacy to consistently engage in healthy behaviors [20]. Adolescents who possess strong confidence in their abilities are more likely to control their behaviors, establish health-related goals, and maintain healthy habits despite exposure to negative environmental influences. In addition, the observational learning process and social reinforcement provided during the intervention motivated respondents to adopt healthy behaviors demonstrated by peers, teachers, and healthcare professionals. During the behavioral maintenance stage, the use of daily journals and periodic evaluations helped adolescents develop self-awareness regarding the behavioral changes they had achieved, thereby enabling healthy behaviors to become more internalized in their daily activities [21].

The improvement in healthy lifestyle adherence in this study was also influenced by the developmental characteristics of adolescents, who are highly affected by social interactions and surrounding environments. Adolescents tend to accept behavioral changes more easily when they receive support from peer groups and the school environment [22]. This condition explains why peer support and teacher support in this study contributed significantly to healthy behavioral changes among respondents. In addition, the step-by-step intervention method provided adolescents with

opportunities to understand their unhealthy behaviors, identify barriers to change, and independently develop behavioral commitments. This approach made respondents feel more involved in the behavioral change process compared to merely receiving one-way health education. The findings also demonstrated that healthy behaviors were easier to maintain when adolescents received positive reinforcement and periodic monitoring. Therefore, the combination of psychological, social, and educational approaches became the primary factor underlying the success of the intervention model in this study.

The analysis of relationships among variables demonstrated that self-efficacy had the strongest association with healthy lifestyle adherence after the intervention. This finding indicates that individuals' confidence in their ability to perform healthy behaviors is the main determinant of successful behavioral change among adolescents. Adolescents with high self-efficacy are more likely to control dietary patterns, increase physical activity, reduce sedentary behavior, and maintain healthy habits despite experiencing social pressure from their surrounding environments [23]. This condition occurs because self-efficacy influences decision-making processes, the ability to overcome barriers, and individuals' resilience in maintaining healthy behaviors. Furthermore, improvements in self-regulation also contributed to the success of the intervention because respondents became more capable of independently monitoring their health behaviors through the use of behavioral journals and periodic evaluations throughout the program [24].

Environmental factors such as family support and peer support also showed significant relationships with improvements in healthy lifestyle adherence. Family support played a role in providing a home environment that supports healthy behaviors, including the availability of nutritious foods, supervision of sleep patterns, and restriction of risky behaviors [25]. Meanwhile, peer support influenced adolescents through processes of social imitation and group acceptance. During adolescence, social acceptance becomes an important psychological need, causing individuals to follow group behaviors in order to be accepted within their social environment. When peer groups demonstrate healthy behaviors, adolescents are more likely to adopt healthy behaviors as well. This condition explains why group-based interventions in this study were more effective because they utilized adolescent social dynamics as a medium for behavioral change. Therefore, healthy lifestyle changes among adolescents are influenced not only by individual abilities but also by the strength of social support received throughout the intervention process.

This study provides important implications for the development of adolescent health promotion programs in school settings. The developed intervention model can serve as a practical guideline for teachers, healthcare professionals, and educational institutions in promoting healthy lifestyle behaviors among adolescents in a more systematic and sustainable manner. In addition to improving healthy lifestyle adherence, this model also has the potential to reduce the risk of non-communicable diseases in adulthood if implemented consistently from adolescence. Nevertheless, this study has several limitations. The one-group pretest-posttest design without a control group means that external factors influencing respondents' behavioral changes could not be fully controlled. In addition, the use of self-report questionnaires may have introduced subjectivity bias and social desirability bias. This study was also conducted in only one school; therefore, the generalizability of the findings to broader adolescent populations remains limited. Consequently, future studies are recommended to employ experimental designs with control groups and broader study settings to obtain stronger evidence regarding intervention effectiveness.

CONCLUSION

The Social Cognitive Theory-based behavioral modification intervention model proved effective in improving healthy lifestyle adherence among adolescents at SMAN 3 Muaro Jambi Regency. The intervention, which was implemented through the stages of introduction, preparation, action, and behavioral maintenance, significantly improved healthy lifestyle adherence scores with a large intervention effect. Self-efficacy, self-regulation, family support, and peer support were identified as the major factors contributing to successful healthy behavioral changes among adolescents.

Schools are expected to implement the Social Cognitive Theory-based behavioral modification intervention model as part of sustainable adolescent health promotion programs. Teachers and healthcare professionals should increase the involvement of families and peers in supporting healthy behavioral changes among adolescents. Future studies are recommended to use experimental designs with control groups and larger sample sizes to improve the generalizability of the findings.