Effectiveness of Depression Prevention Programs in Adolescents: A Systematic Review and Meta-Analysis

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DOI: 10.55489/njcm.160320254839

ABSTRACT

Objective: To examine the effectiveness of depression prevention programs in adolescents through a systematic review and meta-analysis.

Methods: Comprised searching and selecting research from electronic sources using predefined criteria, collecting 16 relevant papers, extracting data, and doing a meta-analysis utilizing RevMan version 5. Furthermore, a fixed effect model was utilized to investigate and evaluate the quality of research using the Cochrane risk of bias tool.

Results: The study included 3,311 participants with a standardized mean difference (SMD) of -0.17 (95% CI: -0.24, -0.10). A considerable data difference (I^2 = 90%, p <0.001) indicates a high degree of variability. Of the total participants, 1,759 youths (53.1%) who attended depression prevention programs reported less depressed symptoms. Subgroup analysis showed that interpersonal psychotherapy (IPT) had an impact size of -2.14 to 2.61 (I^2 = 86%), whereas cognitive-behavioral treatment (CBT) had an effect value of -0.12 (95% CI: -0.19, -0.04) with an I^2 of 79%. A funnel plot study discovered that the CBT subset may have undergone publication bias, whereas the IPT subgroup did not.

Conclusion: Antidepressant regimens, especially those that include interpersonal psychotherapy and cognitive-behavioral therapy, are beneficial in treating depression in adolescents. However, further research is needed due to the large quantity of data disagreement and probable publishing bias in particular regions.

Keywords: Depression, Adolescence, Prevention Programs, Systematic Reviews, Meta-Analyses

ARTICLE INFO

Financial Support: This research was funded by Boromarajonani College of Nursing Sunpasitthiprasong Grant No. RF03/2024.
Conflict of Interest: The authors have declared that no conflict of interests exists.
Received: 06-11-2024, **Accepted**: 25-01-2025, **Published**: 01-03-2025
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How to cite this article: Raksilp M, Krongyudh S, Songserm N, Bussahong S. Effectiveness of Depression Prevention Programs in Adolescents: A Systematic Review and Meta-Analysis. Natl J Community Med 2025;16(3):283-294.
DOI: 10.55489/njcm.160320254839

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www.njcmindia.com | pISSN: 0976-3325 | eISSN: 2229-6816 | Published by Medsci Publications

INTRODUCTION

People often acknowledge depression as one of the most serious and common mental health problems among youth globally.[1] According to a recent study, a disturbing trend involving depression in teens revealed that in 2021, 42% of high school students reported feeling gloomy or hopeless for more than two weeks.[2] Furthermore, among individuals born between 1997 and 2001 at the age of 18, 19.1% of women and 13.4% of males reported severe depression, a considerable increase over the previous generation.[3] Furthermore, long-term studies have found that the incidence of depression in girls increases significantly after age 13, particularly during early adolescence.[4] According to Kaltschik et al[5], 73% of girls and 44% of boys had clinically severe depression symptoms. This is consistent with a fall 2021 survey by Dale et al. which found that 62% of girls and 38.1% of boys exhibited symptoms of depression that exceeded clinical criteria. While a national study in Austria, using DSM-5 criteria, found a lifetime prevalence of depression in adolescents at 6.2%[6], adolescence is a critical stage in life as it transitions from childhood to adulthood, causing significant physical, emotional, and social changes, making it a crucial period for mental health issues. Recent research has discovered a variety of elements that influence the beginning of depression in adolescents, including biological, social, and environmental factors. Family and societal factors are important variables. Qian[7] discovered the family dynamics. Pengpid and Peltzer[8] also propose that social factors such as bullying, loneliness, and a lack of social support may exacerbate teens' mental health problems. In terms of environmental and lifestyle factors, Li[9] and Parida et al[10] discovered that poor lifestyle choices, such as lack of exercise and substance abuse, as well as environmental stressors such as poverty and violence, play a significant role in the development of depression in adolescents. Patanavanich et al[11] revealed that 37.8% of Thai youths are at risk of depression. Furthermore, Thummathai et al[12] found differences between urban and rural areas, with depression rates among urban youth ranging from 14% to 19%. While the incidence of sad mood is around 8% in rural areas, Wichaidit et al[13] discovered 13.2% in a school survey, with variations by age group and gender. Patanavanich et al[11] revealed that e-cigarette use was associated with an increased risk of depression, with 51.6% of e-cigarette users being at risk for the disorder, while Akravuthiyarn et al[14] cited academic stress as a significant factor. Thai high school students are more likely to experience depression than international students. Because of the intensive curriculum. Wichaidit et al[13] found a link between alcohol use and depression, especially among high school females. Furthermore, Sitthi et al[15] found that youth with chronic conditions were more likely to suffer depression, with 11.1% reporting symptoms in a study on cyberbullying and health-risk behaviors. Interestingly, Jantasin et al[16] discovered that the prevalence of depression among pregnant adolescents in Maharashtra Province was 43.9%, which exceeds the Edinburgh metric's criterion for postpartum depression. The poll also revealed a representation of teens aged 11 to 19 who attended school. Thirteen provinces and thirteen health districts nationwide recorded depression, with a PHQ-A score exceeding 10. 17.5% wanted to die. 5.1% had suicidal thoughts, and 6.4% attempted suicide. Students aged 13–14 had a depression prevalence of 25.2% and a suicide risk of 16.8%, with depression being linked to a higher risk of suicide (crude OR=48.53, 95% CI=12.90–182.65). Students with depression are 48 times more likely to commit suicide compared to those without depression ($r = .857$, $p<0.01$).

The World Health Organization defines adolescents as those in their second decade of life, with ages ranging from 10 to 19 years. Baltag et al[17]provide this definition. There are around 1.2 billion people, 90% of whom live in low- and middle-income countries (LMICs). According to WHO, there is a transition in psychological development from infancy to maturity, as well as a change in economic circumstances from economic dependency to the opportunity to seek employment. Adolescents range in age from 10 to 19 years old, and they go through a number of physical, emotional, and social changes that affect their mental well-being. In the long term, these changes can contribute significantly to the development of depression. If these changes are not adequately prevented or cared for, research in the literature has shown that programs aimed at preventing depression in teenagers play a significant role in reducing the risk and improving the mental health of adolescents.

Developing techniques to prevent the formation of depression in teens is an important area of focus. The significant impact depression has on this age group makes it a public health concern. We have developed measures to address this issue, focusing on school implementation. Digital Programs Primary care facilities and family participation. Measures in schools are important because they foster an environment that promotes meticulous execution. It focuses on creating an atmosphere that fosters and develops human talents such as social, emotional, and intellectual control, mental flexibility, and problem-solving skills.[18] Furthermore, studies have demonstrated the effectiveness of school-based interventions such as interpersonal psychotherapy and cognitive-behavioral therapy in treating depression.[19] Gladstone et al[20] discovered that the CATCH-IT program reduces depression symptoms in at-risk adolescents. However, there are still challenges to routine depression screening and family participation. Family engagement is critical in preventing adolescent depression. Research has shown that the Partners in Parenting program, which focuses on developing parenting skills and awareness, effectively reduces depression in high-risk adolescents. Although these techniques look to have a bright future, there are still

challenges to effectively adopting and growing them. Limited access to therapy is a significant issue. The diversity of melancholy and the need for independence in young people are all important issues. Addressing these issues requires a comprehensive plan that includes a variety of methods and takes into account teens' individual needs.[21]

Adolescents are increasingly experiencing depression, a condition that negatively affects their health and quality of life. As a result, developing effective prevention methods is an important public health priority. A range of techniques, including schooling, digital programs, primary care, and family involvement, have addressed this issue. However, there is a lack of comprehensive synthesis of empirical information on the efficiency of these programs, particularly in poor countries, necessitating a thorough literature review and meta-analysis of their usefulness in reducing teenage depression.

METHODOLOGY

Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA) 2020 guideline Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al[22] was followed. We searched and selected the relevant studies that published in Thai and English up to May 2022. The other languages excluded due to lack of resources. The studies were searched from the following databases: PubMed, Google Scholar, ThaiJo, ThaiLis, and Embase. The keywords used in the search based on the PICO framework were as follows: P (Adolescent / (Youth, teenage), I (program), C (control group), and O (depression). Keywords used for searching were "program" and ("adolescent" or "Youth" or "teenage") and "depression."

Inclusion criteria were (1) Publication of quantitative research studying the effects of programs to prevent depression, (2) Age group 10 – 19 years old, (3) published in Thai or English, and (4) having sufficient data for meta-analysis, such as mean, standard deviation, and the sample size of both experimental and control groups. Exclusion criteria were (1) qualitative research, (2) review articles/editorial articles, (3) proceedings, (4) unable to find full research papers, and (5) meta-analysis articles.

Search Outcomes: In the initial data search round, a single researcher searches the database using the designated keywords and selects research projects based on the selection criteria. All relevant research was found. We sourced 295 articles from the PubMed database, 26,484 articles from the Google Scholar database, and 9 articles from the TCI Thaijo database, selecting them based on their titles. Abstract Search and Selection of Research Round 2 Researchers read the abstract and content of the research carefully. Several issues remained unresolved. During the third reading round, we excluded 58 studies from the PubMed database, 2 from Google Scholar, and 7 from TCI Thaijo due to insufficient data for meta-analysis. We can utilize this research for conducting a systematic literature review and meta-analysis. This time, there were 16 stories. (Figure 1).

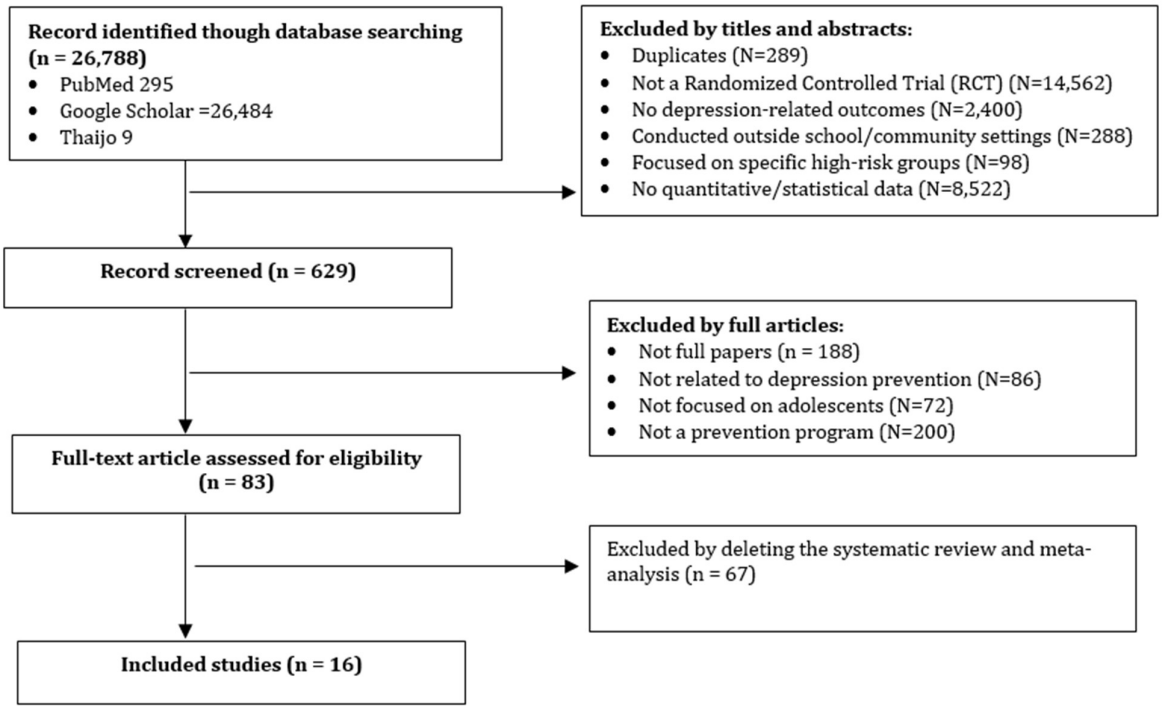

Figure 1: Flowchart of study selection for meta-analysis. Adapted from PRISMA Guidelines

Quality Appraisal: The evaluation of research quality revealed that various psychological therapy concepts and methods effectively classify the prevention of depression in adolescents. Recognized as a leading treatment, cognitive behavioral therapy (CBT) has demonstrated significant effectiveness in reducing depressive symptoms in adolescents. Family therapy, although considered potentially effective, has less robust effects compared to CBT and IPT. Computerized CBT: Becoming a Strong Competitor, Showing Superior Results in the Prevention of Depressive Symptoms The researchers summarized the program's results for preventing depression in adolescents into two forms: 1) interpersonal therapy and 2) a thinking and behavior adjustment program and therapy.[23]

Data Extraction: Researchers developed a form for systematically extracting data from the review. Details in the table include the author's name, year, and country of publication. Research Objectives Characteristics of both experimental and control groups the details of programs that reduce depression in adolescents and the research results are also provided.

Data Synthesis and Analysis: The researchers synthesized general information by summarizing pertinent points, including details of programs that prevent adolescent depression. We analyzed the general characteristics of the sample using descriptive statistics. The Cochran's Q and I2 tests established the statistically significant test value at 0.05. 05, the acceptable criteria for I2 were not important (0-24%), low heterogeneity (25-49%), medium heterogeneity (50-74%), and high heterogeneity (75-100%). Researchers report publication bias test results with a statistical significance test value at the 0.05 level.

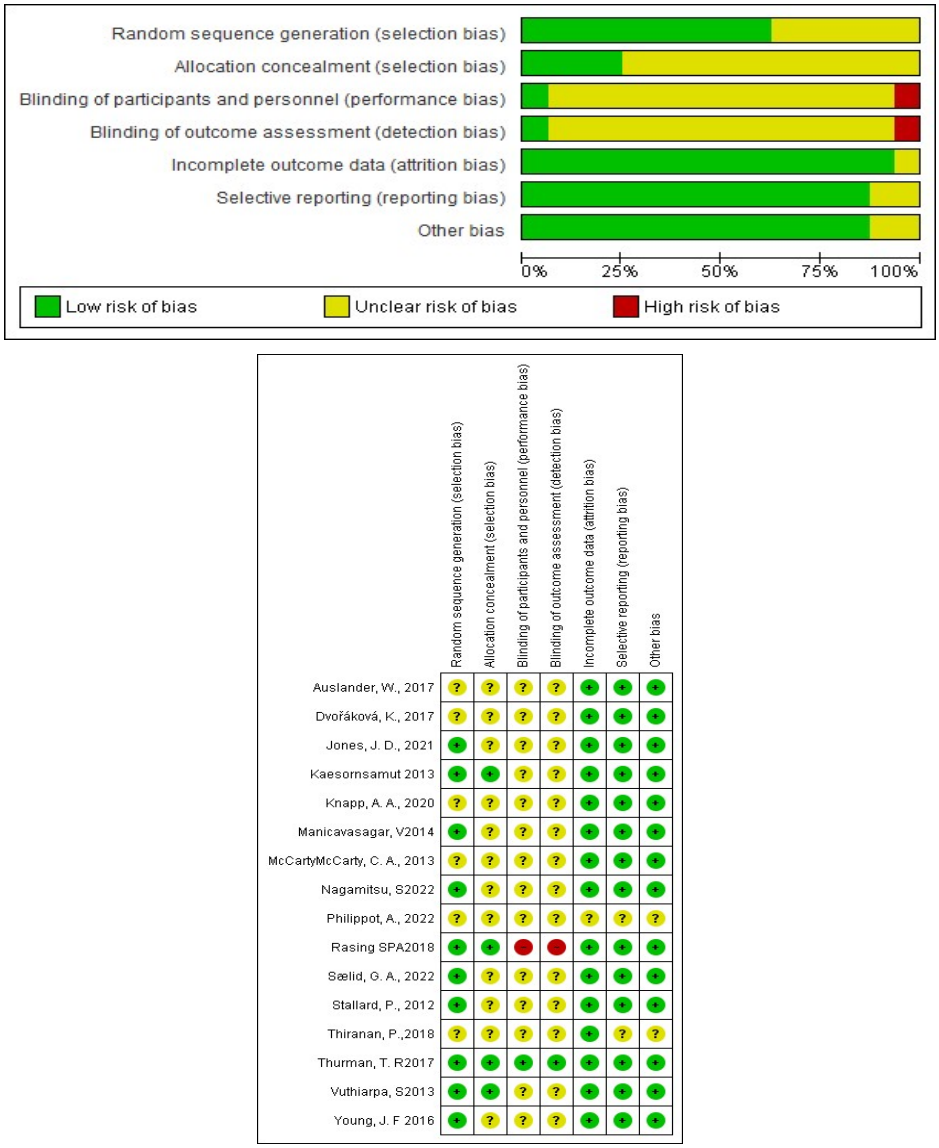

Figure 2: Risk of bias graph and summary

Publication Bias Assessment

The Cochrane Collaboration's tool for assessing risk for bias[24] divides bias assessment into three levels: Low risk means the sum of the risk assessment of bias is low; high risk means the sum of the risk assessment of bias is high; and unclear risk means the risk assessment of bias shows unclear data. The bias assessment of the 6 studies identified 10 random sequence generation cases as random methods, indicating that they posed a low risk. Therefore, the research that uses a method of concealing the sample classification process is considered low risk, while one study is classified as high risk. There were 14 studies that were blinded as low risk. The perception of treatment methods for the sample consisted of 14 studies that were unclear, 1 high risk study due to incomplete outcome data, 15 studies that were evaluated as low risk, and 1 study that was unclear. The other 14 biases are considered low-risk, while two studies lack clear explanations. Three independent reviewers independently assessed each study and reached a consensus about the final assessments through discussion. We recorded the assessment data in the research report's quality assessment form and on the computer using Review Manager Version 5.4 (Figure 2).

RESULTS

Effects of the program on preventing depression in adolescents: The study examined the overall impact of the prevention depression program on adolescents. Based on the analysis results, the total number of adolescent samples was 3,311 out of 16 full-text studies. Of these, 1,759 adolescents (53.12%) who received anti-depression programs experienced a decrease in depression, with a mean difference of -0.17 (-0.24, 0.10) and an *I2* = 90% (Figure 3).

According to the results of the analysis of depression outcomes, after receiving a program to prevent depression in adolescents as a whole from 16 full studies (subgroup analysis), it was found that there was a tendency to develop publication bias, and the researchers used a random effects model, which found that the heterogeneity value was at the level of high heterogeneity (75–100%) (*I2* = 90%; p <0.001) (Figure 4).

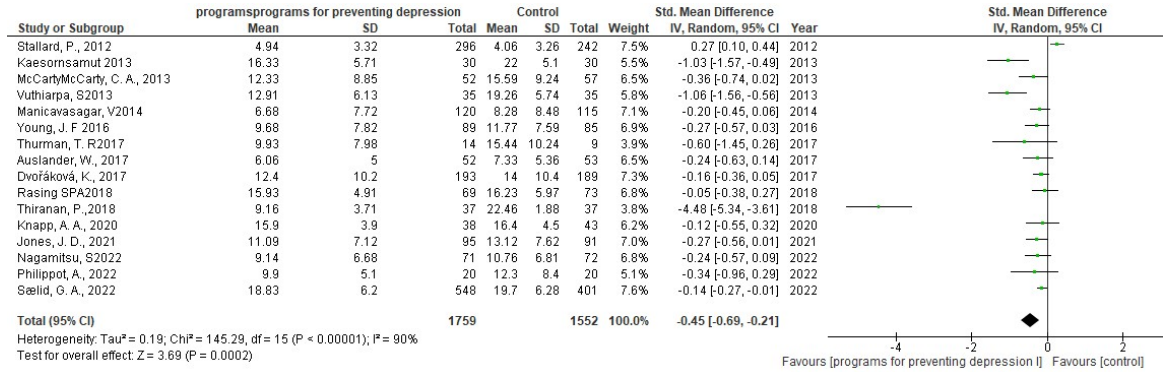

Figure 3: Analysis of the effect of the program on preventing depression in adolescents as a whole

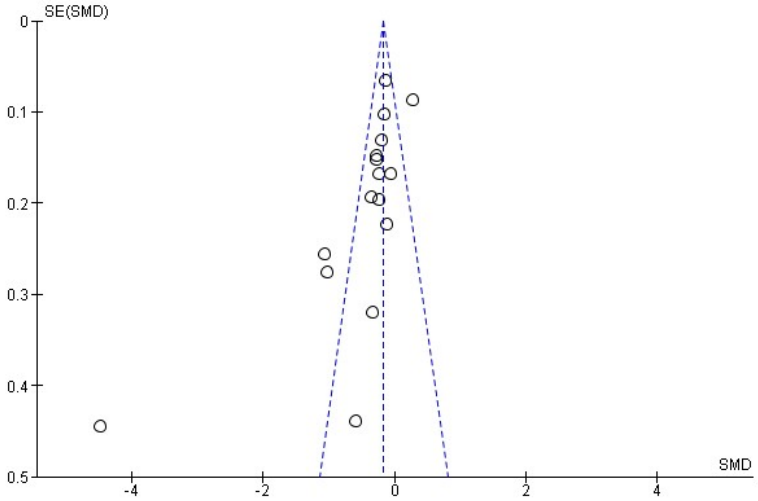

Figure 4: Funnel plot of the program to prevent depression in adolescents as a whole

Table 1: Literature reviews of Effectiveness of Depression Prevention Programs in Adolescents

Author/year/Country	Program/Measures	AGES	intervention		Control		Results
			n	Mean ± SD	n	Mean ± S.D.	
Stallard et al.[24] 2012 (United Kingdom)	-Cognitive behavioural therapy (Classroom based) - RCADS=revised child anxiety and depression scale.	12-16	296	4.94 ± 3.32	242	4.06 ± 3.26	After 12 months, there was no significant reduction in depressive symptoms in the CBT group compared to the other groups.
Kaesornsamut et al.[25] 2013 (Thailand)	Belonging Against Negative Thinking and Depression (BAND) Intervention Program		30	16.33 ± 5.71	30	22.00 ± 5.10	The BAND program significantly improved sense of belonging, reduced negative thinking, and decreased depressive symptoms in Thai adolescents.
McCarty et al.[26] 2013 (USA)	- Positive Thoughts and Actions (PTA)	11-15	52	12.33 ± 8.85	57	15.59 ± 9.24	The Positive Thoughts and Actions (PTA) program is a cognitive-behavioral intervention designed to reduce depressive symptoms in early adolescents.
Vuthiarpa S, et al.[27] 2013 (Thailand)	Cognitive-Behavioral Therapy (CBT)-based group intervention		35	12.91 ± 6.13	35	19.26 ± 5.74	The study focused on a cognitive-behavioral therapy (CBT)-based group intervention aimed at reducing depressive symptoms in Thai adolescents.
Manicavasagar, et al.[28] 2014 (Australia)	Web-Based Positive Psychology Program (Bite Back -the SWEMWBS, and the depression and anxiety subscales of the DASS-21	12-18 years	120 59	6.68 ± 7.72	115 80	8.28 ± 8.48	The iCBT program significantly reduced depressive and anxiety symptoms in adolescents. Improvements reducing depressive symptoms in adolescents. in quality of life were also reported. The intervention group showed greater reductions in depressive symptoms compared to the control group.
Young et al.[29] 2016 (USA)	-IPT-AST IPT-AST - Center for Epidemiologic Studies-Depression Scale (CES-D		89 95	9.68 ± 7.82	85 91	11.77 ± 7.59	The Interpersonal Psychotherapy - Adolescent Skills Training (IPT-AST) program aims to prevent depression by improving interpersonal skills and relationships among adolescents.
Dvořáková, et al.[30] 2017 (USA)	-Learning to BREATHE (L2B) program (80 m/8sesion/4weekd) -The Primary Health Questionnaire (PHQ)	18-19 ปี1	52	6.06 ± 5.00	53	7.33 ± 5.36	The Learning to BREATHE (L2B) program is a mindfulness-based intervention designed to enhance emotional regulation and reduce stress, anxiety, and depressive symptoms.
Auslander, et al.[31] 2017 (USA)	CBITS (Cognitive Behavioral Intervention for Trauma in Schools)	12-18	14	9.93 ± 7.98	9	15.44 ± 10.24	The study evaluated a trauma-focused cognitive behavioral therapy (TF-CBT) program adapted for adolescents in foster care to reduce depressive and PTSD symptoms.
Thurman et al.[32] 2017 (South Africa)	- Bereavement Support Group (Abangane Program) -Center for Epidemiological Studies-Depression Scale for Children. Core Bereavement Items (CBI-G)	3-17 years	193	12.4 ± 10.2	189	14.0 ± 10.4	The Abangane program is a bereavement support group designed to help female adolescents cope with the loss of a loved one.

Author/year/Country	Program/Measures	AGES	intervention		Control		Results
			n	Mean ± SD	n	Mean ± S.D.	
Rasing, et al.[33] 2018 (Netherlands)	Cognitive Behavioral Therapy (CBT)-based STARr program	14.01 Years (SD=1.22) 11–14	69	15.93 ± 4.91	73	16.23 ± 5.97	The level of depression symptoms was not significantly different at baseline between participants in the intervention condition compared to participants in the control condition
Phiwpha, et al.[34] 2019 (Thailand)	Cognitive Behavioral Therapy (CBT)-based group intervention		37	9.16 ± 3.71	37	22.46 ± 1.88	The CBT-based group intervention significantly reduced depressive symptoms and improved self-esteem and coping skills among participants.
Knapp, et al.[35] 2020 (United States)	Anxiety Sensitivity Amelioration Program for Youth (ASAP-Y)	10-14	38	15.9 ± 3.9	43	16.4 ± 4.5	Reduced anxiety sensitivity (AS), which in turn reduced both anxiety and depressive symptoms at the one-month follow-up. The intervention group showed more pronounced reductions in AS compared to the control group. No significant differences were observed in emotional reactivity between groups.
Jones, et al.[36] 2021 (United States)	- Interpersonal Psychotherapy-Adolescent Skills Training (IPT-AST) - CES-D score of 16 or higher	m= 14.01, SD = 1.22	95	11.09 ± 7.12	91	13.12 ± 7.62	The IPT-AST group showed significantly greater improvements in depressive symptoms andoverall functioning compared to the control group. Effect sizes were small to medium (d = 0.31). Improvements were sustained at the 6-month follow-up.
Sælid, et al.[37] 2022 (Norway)	-MindPower programa (modification of the Coping with Depression (CWD)) -Reynolds Adolescent Depression Scale (RADS-2:SF) (School-based mental health intervention program)	12-16	548	18.83 ± 6.20	401	19.7 ± 6.28	The intervention significantly reduced depressive and anxiety symptoms compared to the control group. Participants reported improved overall mental health and well-being.
Philippot, et al.[38] 2022 (Belgium)	-Structured Physical Exercise Therapy -Hospital Anxiety Depression Scale (HADS)	less than 18 years of age	20	9.9 ± 5.1	20	12.3 ± 8.4	The physical exercise group showed a significant reduction in depressive symptoms, with a mean decrease of 3.8 points on the HADS-D compared to 0.7 points in the control group. No significant changes were observed for anxiety symptoms.
Nagamitsu et al.[39] 2022 (Japan)	- Trait Emotional Intelligence Program -Depression Self-Rating Scale for Children (DRSC)	12-16	8.27	6.39 ± 132	10.76	6.81 ± 70	Primary Outcome: Change in depressive symptoms. Secondary Outcomes: Changes in self-esteem, quality of life, self-monitoring skills, and adolescent health promotion scale scores

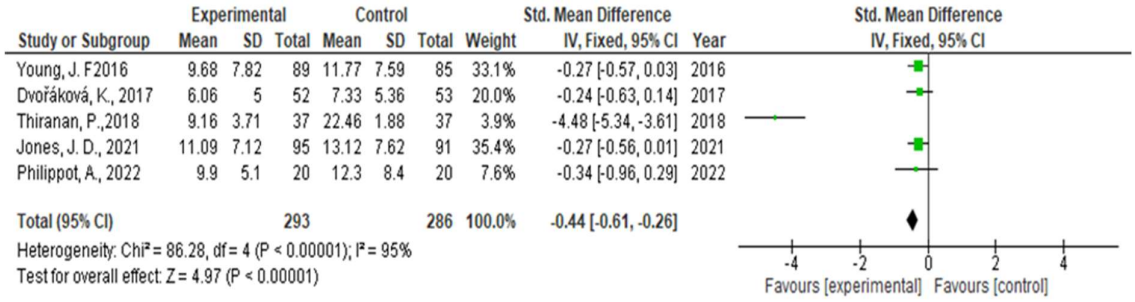

Figure 5: Analysis of the Effects of Interpersonal Psychotherapy

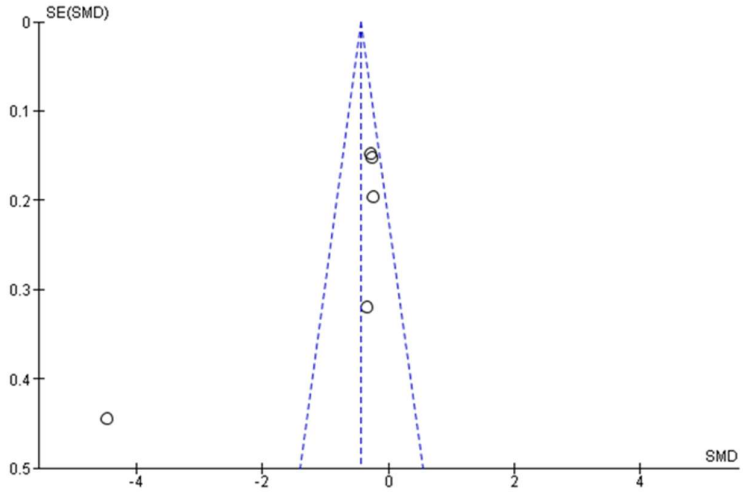

Figure 6: Funnel plot of Interpersonal Psychotherapy

Interpersonal Psychotherapy - IPT): In the analysis of the effect of Interpersonal Psychotherapy (IPT) in the prevention of depression in adolescents using the Std. Mean Difference, it was found that the results of the analysis of the data difference were high heterogeneity (75-100%) (I2=95%; p<0.001). According to the results of the analysis, a total of 579 adolescents from 5 full studies were enrolled in the program, with a decrease in depression with a mean difference of - (2.14, 2.61) and an I^2 value of 86% (Figure 5).

From the results of the analysis Adolescents who received anti-depression programs and interpersonal therapy health by subgroups analysis found that the funnel plots were distributed on a symmetrical graph. so, In addition, the researchers used a Random Effects Model, which found that the heterogeneity value was at the high heterogeneity level (75-100%) (I^2=95%; p<0.001) (Figure 6).

Cognitive Behavioral Therapy: A standard mean difference test was used to look at the results of cognitive behavioral therapy (CBT). The results showed that there were a lot of differences between the groups, with a high level of heterogeneity (75–100%) (I^2 = 79%; p<0.001) from 14 large studies that included a total of 2732 people (Figure 7).

The subgroup analysis revealed the outcomes of cognitive behavioral therapy (CBT). It was found that the funnel plot was distributed asymmetrically on the graph. In addition, the researchers used a Random Effects Model, which found that the heterogeneity value was high, high heterogeneity (75-100%) (I^2 = 79%; p<0.001) (Figure 8).

Discussion

The study examined the program's overall impact on preventing depression in adolescents. The Standardized Mean Difference (SMD) was used for the analysis, which showed that the data difference was high heterogeneity, with I^2 = 90% and p <0.001. The mean difference was -0.17 (confidence interval -0.24 to 0.10), indicating a positive outcome in reducing depressive symptoms. This suggests that such programs can be beneficial in mitigating depressive symptoms in adolescents. The following sections will delve into specific aspects of these programs and their outcomes. Research has demonstrated that school-based interventions, which provide structured support and education within the school environment, effectively reduce depressive symptoms in adolescents.[40] Many students can access these programs, which often integrate cognitive-behavioral strategies into the school curriculum.[41]

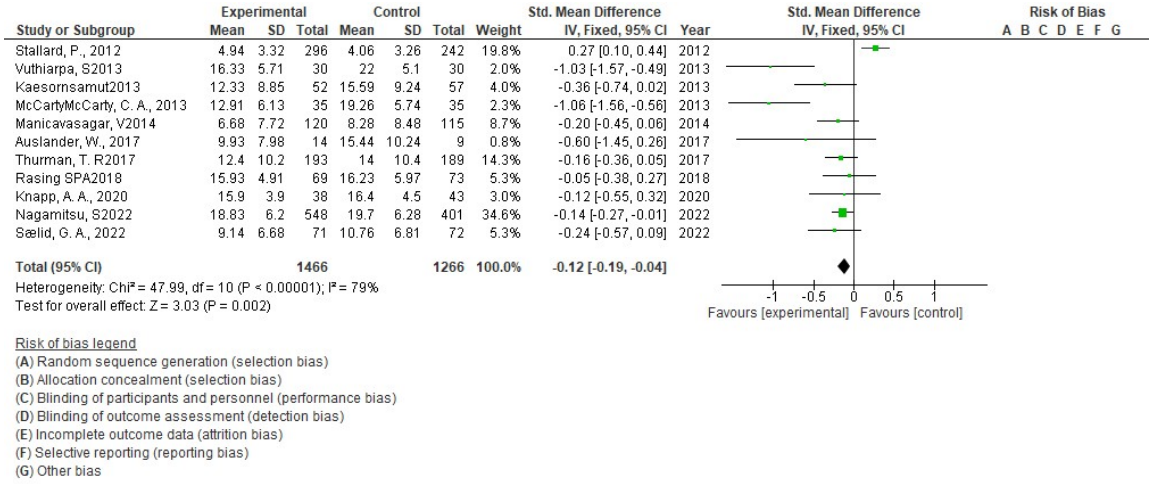

Figure 7: Analysis of the effects of cognitive and behavioral modification program therapy

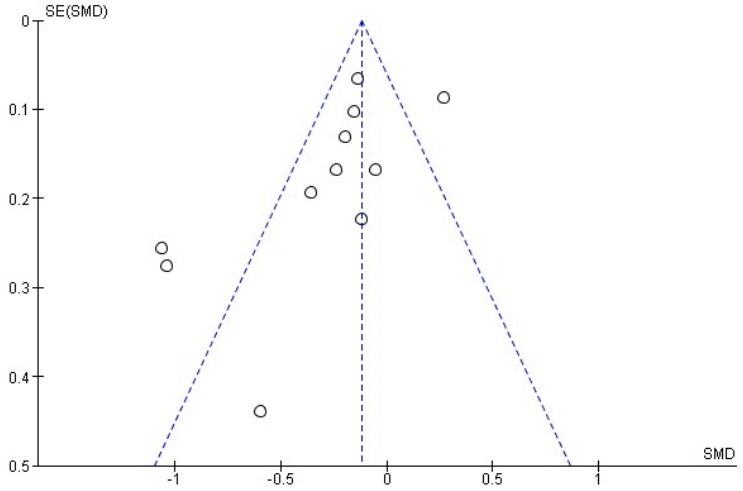

Figure 8: Funnel plot of Cognitive and Behavioral Adjustment Program

A comprehensive review and meta-analysis found that school-based programs significantly decreased depression symptoms, while the benefits were restricted by program design, dosage, and participant demographics.[42]

The results of interpersonal psychotherapy (IPT) were found to be highly effective in reducing depression in adolescents, with a mean difference of -2.14 to 2.61 and an I^2 value of 95%, indicating a very high data diversity. We found that IPT significantly reduced depression symptoms from a total of 5 studies with a sample of 579 adolescents, and it was not susceptible to publication bias due to the symmetrical distribution of the funnel plot. A systematic review and meta-analysis of randomized controlled trials (RCTs) revealed a significant reduction in depressive symptoms among adolescents following IPT interventions, with a standardized mean difference (SMD) of -0.42, indicating a moderate effect size.[43] Cognitive behavioral therapy (CBT) has also shown effectiveness in reducing depression in adolescents, with a mean difference of -0.12 (confidence interval -0.19 to -0.04) and I^2 = 79%. From a total of 11 studies with a sample of 2,732 adolescents, the CBT program significantly reduced depression but found a tendency to publish bias due to the asymmetrical distribution of the funnel plot.

CBT employs cognitive restructuring and behavioral activation to address depressive symptoms. These mechanisms help adolescents reframe negative thought patterns and engage in positive behaviors, which are crucial for alleviating depression.[44]

The therapy is effective in both individual and group formats, providing flexibility in its application.[45] Research shows that cognitive-behavioral therapy (CBT)-based treatments effectively reduce depressive symptoms in high-risk adolescents.[41,46] The results of the study showed that both IPT and CBT programs were effective in preventing and reducing depression in adolescents, especially in the post-treatment period.[47] In addition, IPT programs appear

to have more sustainable effectiveness compared to CBT in the long run. The long-term efficacy of depression prevention programs differs, with some research demonstrating long-term effects and others suggesting that the advantages may wane with time. This emphasizes the need of continued support and follow-up therapy in sustaining excellent results.[48] Individual and environmental variables impact the efficacy of depression prevention programs. Interventions targeted to the unique requirements of distinct young groups may be more successful.[42]

Limitations

High heterogeneity: The results of the analysis showed that there was a high level of data diversity (I^2 was up to 90% overall and 95% for IPT), indicating that there was a large difference between each study analyzed.

Differing sample sizes: Some studies have small sample sizes, such as the IPT program with only 579 participants from 5 subjects, which may cause the results to be less accurate than studies with larger sample sizes, such as the CBT program with 2,732 participants from 11 subjects.

Follow-up period: Some studies may not conduct long-term follow-ups, which makes it difficult to determine whether these programs are effective in preventing depression over the long term.

Publication bias may influence the results of this meta-analysis, potentially overestimating the effectiveness of depression prevention programs. To address this: We conducted a funnel plot analysis to assess publication bias. To minimize publication bias in future research, we recommend: Pre-registration of clinical trials, Encouraging publication of null or negative findings and comprehensive searches of grey literature and unpublished studies

Conclusion

From systematic reviews and meta-analyses. Programs to prevent depression in adolescents, particularly interpersonal therapy (IPT) and cognitive and behavioral modification (CBT) programs, significantly reduced depression in adolescents, especially when assessed after treatment. However, the high diversity of data and the tendency to publication bias are important limitations to consider. While CBT programs also show positive results, they are prone to publication bias. The findings encourage healthcare providers can use the finding to implement depression programs.

Further studies on factors that affect the effectiveness of programs, such as age, gender, and initial risk level, as well as longitudinal studies to assess long term program efficacy and explore factor such as cultural relevance, technology use and scalability.

Acknowledgements: Our thanks to Boromarajonani College of Nursing, sunpasitthiprasong for support the funding. There are no other conflicts of data collection or study quality to declare.

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