

Test file: Effectiveness of School-Based Mental Health Interventions on Adolescent Depression: A Cluster Randomized Trial

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Abstract

This cluster randomized trial evaluated the effectiveness of a school-based mental health intervention on depressive symptoms among 3,245 adolescents from 42 secondary schools. The intervention included cognitive-behavioral therapy sessions, mental health literacy education, and teacher training. After 12-month follow-up, intervention schools showed significantly greater reduction in depressive symptoms compared to control schools. Subgroup analysis revealed stronger effects for students with baseline depressive symptoms and those from low-income families. School-based mental health programs represent an effective strategy for addressing the growing burden of adolescent depression.

Keywords: Adolescent Depression; School-Based Intervention; Mental Health; Cluster Randomized Trial; Public Health; Prevention

1. Introduction

Depressive disorders represent a leading cause of disability among adolescents worldwide, with prevalence rates increasing significantly in recent decades. The early onset of depression during adolescence is associated with substantial functional impairment, academic difficulties, and increased risk of suicide. Despite the high burden and availability of effective treatments, most adolescents with depression do not receive adequate mental healthcare due to stigma, cost, and limited access to specialized services. Schools provide an ideal setting for implementing mental health interventions, offering access to large populations of adolescents and the potential to integrate services into existing educational structures. While previous school-based interventions have shown promise, many have been limited by methodological constraints, short follow-up periods, and insufficient attention to implementation factors. This cluster randomized trial aims to evaluate the effectiveness of a comprehensive school-based mental health intervention on depressive symptoms in adolescents, examining both overall effects and differential impacts across demographic and clinical subgroups.

2. Methods

2.1 Study Design and Participants

We conducted a cluster randomized controlled trial in 42 secondary schools, with randomization at the school level to minimize contamination. Schools were stratified by socioeconomic status and location before random allocation to intervention or control groups. A total of 3,245 students aged 13-16 years participated, with written informed consent obtained from both students and parents. The study was conducted between September 2021 and June 2023, with assessments at

baseline, 6 months, and 12 months. The trial was registered and received ethical approval from the institutional review board.

2.2 Intervention Components

The multicomponent intervention included three core elements: 1) Eight weekly cognitive-behavioral therapy sessions delivered by trained school counselors, focusing on cognitive restructuring, behavioral activation, and problem-solving skills; 2) Mental health literacy curriculum integrated into existing health education classes, addressing stigma reduction, help-seeking behaviors, and self-care strategies; 3) Teacher training program to enhance recognition of depressive symptoms and appropriate referral procedures. Control schools continued with usual practices, which included access to standard school counseling services but no structured mental health program.

2.3 Outcome Measures and Statistical Analysis

The primary outcome was change in depressive symptoms measured by the Children's Depression Inventory. Secondary outcomes included anxiety symptoms, academic performance, school attendance, and quality of life. We used linear mixed models with random intercepts for schools to account for clustering, adjusting for baseline scores, age, gender, and socioeconomic status. Intention-to-treat analysis was performed, with multiple imputation for missing data. Subgroup analyses examined intervention effects by baseline depression severity, gender, socioeconomic status, and previous mental health service use.

3. Results

3.1 Primary Outcome Analysis

At 12-month follow-up, students in intervention schools showed significantly greater reduction in depressive symptoms compared to controls. The between-group difference in CDI score change was -2.45 points, representing a small to moderate effect size. The intervention group demonstrated a 28% reduction in the prevalence of clinically significant depressive symptoms compared to the control group. Effects were maintained across both 6-month and 12-month assessments, with no evidence of effect attenuation over time.

3.2 Subgroup and Secondary Outcomes

Subgroup analysis revealed stronger intervention effects for students with elevated depressive symptoms at baseline and those from low-income families. No significant differential effects were observed by gender or age. For secondary outcomes, the intervention was associated with reduced anxiety symptoms, improved academic engagement, and better school attendance. However, no significant differences were found for academic achievement test scores. Process evaluation indicated high program fidelity and good acceptability among students and school staff.

4. Discussion

This cluster randomized trial demonstrates that a comprehensive school-based mental health intervention can effectively reduce depressive symptoms in adolescents. The findings are particularly significant given the increasing rates of adolescent depression and limited access to traditional mental health services. The stronger effects observed among students with existing symptoms suggest the intervention's utility for both indicated prevention and early intervention. The socioeconomic gradient in intervention response highlights the potential of school-based programs to address mental health inequities. The study's strengths include the cluster randomized

design, large sample size, long follow-up period, and comprehensive implementation evaluation. Limitations include reliance on self-reported outcomes, potential response bias, and limited generalizability to non-school settings. Future research should investigate cost-effectiveness, long-term outcomes, and implementation strategies for scaling up effective school mental health programs.

5. Conclusion

School-based mental health interventions represent an effective approach for addressing adolescent depression, particularly for vulnerable subgroups. The successful implementation of this multicomponent program demonstrates the feasibility of integrating evidence-based mental healthcare into educational settings. Policy makers and educational authorities should consider systematic implementation of school mental health programs as part of comprehensive adolescent health strategies. Future efforts should focus on sustainable implementation, teacher training, and integration with community mental health services to create continuum of care for young people's mental health needs.

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