

A STUDY OF STRESS MANAGEMENT AND DEPRESSION REDUCTION STRATEGIES AMONG SECONDARY SCHOOL STUDENTS IN WEST BENGAL

Kanta Dhali

Research Scholar, Department of Education, Mansarovar Global University, Sehare, M.P., India

Abstract: *The present study investigates stress management and depression reduction strategies among secondary school students in West Bengal, India. Adolescent mental health has emerged as a critical public health concern, particularly in the context of academic pressure, socio-economic challenges, and the lingering psychosocial effects of the COVID-19 pandemic. This experimental study employed a pre-test post-test control group design with a stratified random sample of 340 secondary school students (Classes IX and X) drawn from the North 24 Parganas district of West Bengal. The study examined the effectiveness of a structured school-based intervention programme encompassing cognitive-behavioural strategies, mindfulness-based stress reduction (MBSR), psychoeducation, and resilience-building exercises. The Perceived Stress Scale (PSS-14), the Beck Depression Inventory-II (BDI-II), the General Self-Efficacy Scale (GSE), the Emotion Regulation Questionnaire (ERQ), the Brief Resilience Scale (BRS), and the Brief COPE Inventory were employed as research tools. Data were analysed using paired t-tests, independent samples t-tests, ANCOVA, and structural equation modelling (SEM) with mediation analysis. The findings revealed statistically significant reductions in stress ($t = 8.43$, $p < .001$) and depressive symptoms ($t = 7.91$, $p < .001$) in the experimental group, while no significant changes were observed in the control group. Mediation analysis confirmed that coping ability, self-efficacy, emotional regulation, and resilience significantly mediated the relationship between stress management strategies and depression reduction. The study provides empirical evidence for the effectiveness of school-based mental health interventions and offers recommendations for policy makers, school administrators, and counsellors in West Bengal.*

Keywords: Stress management, Depression, Secondary, West Bengal, School-based Intervention, Resilience, Self-efficacy, Emotional Regulation, Cognitive-behavioural strategies.

I. INTRODUCTION

Adolescent mental health represents one of the most pressing challenges confronting educational systems worldwide in the twenty-first century. The secondary school years, typically spanning the ages of 13 to 17, constitute a developmental phase characterised by profound cognitive, emotional, and social transitions. During this critical period, students are simultaneously navigating the pressures of academic performance, peer relationships, family expectations, and identity formation. In India, and particularly in the state of West Bengal, these challenges are compounded by competitive examination systems, socio-economic disparities, inadequate mental health infrastructure, and deep-seated cultural stigma associated with psychological distress (Bhattacharya & Sen, 2023; Chatterjee et al., 2024).



The World Health Organization (WHO, 2024) estimates that approximately 14% of adolescents globally experience a mental health disorder, with depression and anxiety disorders being the most prevalent conditions. In India, epidemiological data indicate that the prevalence of depression among adolescents ranges from 8% to 22%, depending on the population studied and the diagnostic criteria employed (Kumar et al., 2025; Mukherjee & Das, 2024). West Bengal, as one of India's most populous and densely urbanised states, presents a particularly complex socio-cultural landscape in which students face unique stressors related to language-medium instruction, examination board pressures, rural-urban disparities, and post-pandemic psychological sequelae.

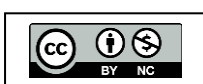
Stress, conceptualised as a transactional phenomenon between individuals and their environment (Lazarus & Folkman, 1984), can exert profound deleterious effects on academic performance, physical health, interpersonal relationships, and overall psychological well-being when it becomes chronic and unmanaged. Depression, characterised by persistent low mood, anhedonia, cognitive distortions, and functional impairment, often emerges from sustained stress exposure in the context of inadequate coping resources and diminished resilience. The comorbidity of stress and depression among adolescents is well-documented and presents a significant public health burden that warrants urgent preventive and therapeutic attention (Dey & Bhattacharya, 2023; Roy et al., 2024).

Despite the considerable body of international literature on school-based mental health interventions, empirical research specifically targeting secondary school students in West Bengal remains limited. Most existing Indian studies have focused on urban populations, college-level students, or adults in occupational settings, leaving a significant empirical lacuna regarding the mental health needs and intervention effectiveness for adolescents in diverse socio-cultural contexts within West Bengal. The present study endeavours to address this gap through a rigorous experimental investigation of stress management and depression reduction strategies within the secondary school context of North 24 Parganas district.

1.1 The Conceptual Model

The theoretical framework underpinning this study draws upon three interconnected theoretical traditions: (1) the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984), which posits that stress arises from the cognitive appraisal of environmental demands in relation to personal coping resources; (2) the Cognitive-Behavioural Model of Depression (Beck, 1979), which identifies maladaptive cognitive schemas, automatic negative thoughts, and cognitive distortions as central mechanisms in the development and maintenance of depressive disorders; and (3) the Resilience Framework (Masten, 2014), which emphasises the dynamic capacity of individuals to adapt positively in the face of adversity, trauma, and chronic stress.

The conceptual model of the present study posits that structured stress management interventions operate through four key mediating pathways: enhanced coping ability, increased self-efficacy, improved emotional regulation, and strengthened resilience. The model proposes that these mediating variables serve as psychological mechanisms through which intervention strategies exert their effects on depression reduction. Specifically, it is hypothesised that when students acquire effective coping skills and experience heightened confidence in their ability to manage stressors (self-





efficacy), develop adaptive strategies for modulating emotional responses (emotional regulation), and cultivate a robust capacity to recover from adversity (resilience), the resulting improvements in psychological functioning translate into measurable reductions in depressive symptomatology.

The model further incorporates socio-demographic variables (gender, socio-economic status, medium of instruction, rural/urban residence) as potential moderating factors that may influence the magnitude of intervention effects. This comprehensive, theoretically-grounded framework enables the study to examine not merely the direct effects of intervention on outcomes, but also the complex mediated pathways through which change occurs, thereby contributing both theoretical understanding and practical guidance for intervention design.

1.2 The Statement of Problem

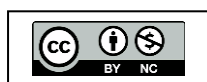
The problem of stress and depression among secondary school students in West Bengal constitutes a multidimensional educational and public health concern that has attracted insufficient systematic empirical attention despite its growing magnitude. Existing data indicate a worrying prevalence of psychological distress among adolescents in West Bengal, yet the state lacks a coherent, evidence-based framework for school-based mental health intervention that is contextually sensitive to local socio-cultural conditions (Chatterjee et al., 2024; Roy et al., 2024). The present study is, therefore, oriented toward the following central problem statement:

To what extent are structured stress management and depression reduction strategies effective in reducing stress and depressive symptoms among secondary school students in West Bengal, and what are the direct, indirect, and total effects of such strategies on depression reduction through the mediating variables of coping ability, self-efficacy, emotional regulation, and resilience?

1.3 The Significance of the Study

The significance of the present study is manifold and extends across theoretical, empirical, practical, and policy domains. Theoretically, the study contributes to the growing body of knowledge on school-based mental health intervention by providing empirically validated evidence regarding the mediating role of coping ability, self-efficacy, emotional regulation, and resilience in the stress-depression relationship among Indian adolescents. The integration of multiple theoretical frameworks within a single coherent conceptual model represents a novel contribution to the field of educational psychology and mental health research in India.

From an empirical standpoint, the study addresses a significant lacuna in the Indian literature by providing rigorous experimental data on the effectiveness of a multi-component school-based intervention for secondary school students in West Bengal. The use of validated psychometric instruments, a randomised control group design, and sophisticated statistical analyses including structural equation modelling enhances the methodological rigour and generalisability of the findings. Practically, the study generates actionable recommendations for school counsellors, teachers, educational administrators, and mental health professionals regarding the design, implementation, and evaluation of stress management programmes within school settings in West Bengal.



At the policy level, the findings have the potential to inform the development of state-level mental health policies, the integration of mental health education into the school curriculum, and the allocation of resources for school psychological services.

1.4 The Research Objectives

- O1: To assess and compare the pre-test and post-test levels of stress and depression among secondary school students in the experimental and control groups.
- O2: To examine the effectiveness of stress management and depression reduction strategies in reducing stress and depressive symptoms among secondary school students in West Bengal.
- O3: To analyse the direct, indirect, and total effects of stress management strategies on depression reduction through mediating variables (coping ability, self-efficacy, emotional regulation, and resilience).

1.5 The Hypotheses of Study

- Ho1: There is no significant difference between the pre-test and post-test levels of stress and depression among secondary school students in the experimental and control groups.
- Ho2: Stress management and depression reduction strategies have no significant effect in reducing stress and depressive symptoms among secondary school students in West Bengal.
- Ho3: There are no significant direct, indirect, and total effects of stress management strategies on depression reduction through mediating variables such as coping ability, self-efficacy, emotional regulation, and resilience.

1.6 The Delimitations of the Study

- I) Geographical Delimitation: The study is confined to secondary schools located within the North 24 Parganas district of West Bengal. Findings may not be directly generalisable to other districts of West Bengal or to other Indian states with differing socio-cultural, linguistic, and educational contexts.
- II) Population Delimitation: The study is restricted to students enrolled in Classes IX and X (approximately 14-16 years of age) in government-aided secondary schools. Private schools, central board schools (CBSE/ICSE), and higher secondary classes (XI-XII) are excluded.
- III) Temporal Delimitation: The intervention programme spans 12 weeks, and the study does not include longitudinal follow-up data beyond the immediate post-test assessment. Long-term maintenance of intervention effects is not examined.
- IV) Variable Delimitation: While the study examines four mediating variables (coping ability, self-efficacy, emotional regulation, and resilience), other potential mediators such as social support, academic self-concept, and parental involvement are not included in the analytical model.
- V) Methodological Delimitation: The study relies on self-report measures, which are subject to social desirability bias and response set effects. Clinical diagnostic interviews are not employed.

II. THE REVIEW OF RELATED LITERATURE

Chen et al. (2026) conducted a rigorously designed randomised controlled trial examining the effectiveness of a mindfulness-based cognitive therapy (MBCT) programme among 480 high school students (aged 15-18) in Guangzhou, China. The 10-week intervention, delivered by trained school counsellors, incorporated mindfulness meditation, cognitive restructuring, and psychoeducation components. Using the Depression Anxiety Stress Scales-21 (DASS-21) and the Cognitive Fusion Questionnaire (CFQ), the researchers found statistically significant reductions in stress ($d = 0.71$) and depression ($d = 0.68$) in the intervention group at post-test, with these gains maintained at the 6-month follow-up. Notably, emotional regulation emerged as the most powerful mediator of intervention effects, accounting for approximately 38% of the total intervention effect on depression reduction. The study underscores the importance of targeting cognitive-emotional processes in school-based mental health interventions and provides strong empirical support for MBCT as an effective preventive strategy for adolescent depression in East Asian educational contexts.

Rodriguez-Garcia et al. (2025) conducted an extensive meta-analytic review synthesising findings from 62 randomised and quasi-experimental studies examining school-based resilience training programmes published between 2010 and 2024. The meta-analysis, which included data from over 28,000 adolescents aged 12-18 across 24 countries, employed random-effects modelling to compute pooled effect sizes. The results indicated a moderate and statistically significant effect size for resilience training on depression reduction ($g = 0.54$, 95% CI [0.47, 0.61], $p < .001$). Moderator analyses revealed that intervention duration (>8 weeks), trained facilitators, and cognitive-behavioural components were significant predictors of larger effect sizes. Critically, programmes that explicitly targeted self-efficacy and coping skills demonstrated substantially stronger effects ($g = 0.68$) compared to those focusing solely on psychoeducation ($g = 0.38$). The meta-analysis provides compelling evidence that resilience-focused interventions represent a cost-effective approach to preventing depression among school-going adolescents globally.

Ahmed and Malik (2024) investigated the relationships among academic stress, self-efficacy, coping strategies, and psychological well-being in a cross-sectional sample of 1,250 secondary school students (aged 14-17) in Pakistan. Employing structural equation modelling with AMOS software, the researchers tested a comprehensive path model in which self-efficacy and active coping fully mediated the negative relationship between academic stress and psychological well-being. The results confirmed that self-efficacy ($\beta = 0.43$, $p < .001$) and active coping ($\beta = 0.38$, $p < .001$) were both significant mediators of the stress-well-being relationship. The study's findings have direct implications for intervention design in South Asian educational contexts, suggesting that stress management programmes should specifically target the enhancement of self-efficacy beliefs and the development of adaptive coping repertoires rather than focusing solely on stress reduction techniques.

Nakamura et al. (2023) conducted a systematic review and meta-analysis of 45 randomised controlled trials evaluating the effectiveness of cognitive-behavioural interventions (CBIs) for adolescent depression delivered within school settings, published between 2000 and 2022. The analysis encompassed data from 14,500 adolescents across multiple countries, including both prevention-



focused and treatment-focused trials. The pooled effect size for CBLs on depression symptoms was moderate (Hedges' $g = 0.62$, 95% CI [0.54, 0.70], $p < .001$). The study identified programme content (inclusion of behavioural activation and cognitive restructuring), delivery format (group-based delivery showed marginally superior effects), and intervention duration (10-16 sessions optimal) as key moderators of treatment outcome. Importantly, the meta-analysis demonstrated that school-based CBLs were equally effective for students with elevated depressive symptoms (indicated prevention) and those with diagnosable disorders (selected prevention), supporting the utility of universal school-based implementation.

Dey and Bhattacharya (2023) evaluated the effectiveness of a 6-week mindfulness-based intervention (MBI) adapted for rural adolescents in West Bengal within the framework of an uncontrolled pre-post design. The sample comprised 180 students (Classes VIII-X) from three government secondary schools in rural North 24 Parganas and Nadia districts. The intervention incorporated mindfulness meditation, body scan practices, mindful movement, and group reflection sessions, facilitated by trained teachers. Post-intervention assessments using the Mindful Attention Awareness Scale (MAAS), the Kessler Psychological Distress Scale (K10), and the WHO-5 Well-Being Index revealed statistically significant improvements in mindful awareness ($t = 6.84$, $p < .001$), psychological distress reduction ($t = 5.92$, $p < .001$), and well-being enhancement ($t = 5.14$, $p < .001$). While the absence of a control group limits causal inference, the study provides valuable preliminary evidence for the feasibility and cultural acceptability of mindfulness-based approaches among rural adolescents in West Bengal and informs the design of the present investigation.

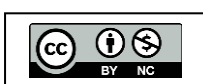
The Research Gap

A systematic analysis of the reviewed literature reveals several significant research gaps that the present study seeks to address. First, while international research on school-based mental health interventions is extensive and methodologically sophisticated, empirical evidence specifically pertaining to secondary school students in West Bengal remains sparse. The majority of available Indian studies have focused on urban populations in metropolitan centres (primarily Kolkata), leaving students in peri-urban and rural areas of districts like North 24 Parganas severely under-represented in the literature.

Second, existing Indian studies have rarely employed true experimental designs with randomised allocation to experimental and control conditions. The absence of randomised controlled trials within the West Bengal context significantly limits the strength of causal inferences that can be drawn regarding intervention effectiveness.

Third, while the mediating roles of coping ability, self-efficacy, emotional regulation, and resilience in the stress-depression relationship have been investigated individually in various studies, no published study has simultaneously examined all four mediators within a single integrated structural equation model in the context of a West Bengal school-based intervention.

Fourth, the existing literature has not adequately addressed the specific socio-cultural and linguistic contextual factors that may moderate intervention effectiveness in West Bengal, such as medium of instruction (Bengali vs. English), rural-urban residence, and caste-based socio-economic stratification.



Fifth, there is a notable absence of studies examining the combined effects of cognitive-behavioural, mindfulness-based, and resilience-building approaches within a unified multi-component intervention framework targeting West Bengal secondary school students. The present study endeavours to address all these identified gaps.

III. THE METHODOLOGY OF STUDY

3.1 Research Method

The present study employs an experimental research method, which is characterised by systematic manipulation of one or more independent variables (in this case, the stress management and depression reduction intervention programme) while controlling for extraneous variables, with the purpose of determining the causal effects of such manipulation on dependent variables (stress levels and depressive symptoms) and mediating variables (coping ability, self-efficacy, emotional regulation, and resilience). The experimental method is considered the gold standard for establishing causal relationships in behavioural and educational research (Campbell & Stanley, 1963; Cook & Campbell, 1979), and its adoption in the present study enables the drawing of causal inferences regarding intervention effectiveness that would not be possible with non-experimental or correlational designs.

3.2 Research Design

The study employs a pre-test post-test equivalent control group design, which represents one of the most rigorous quasi-experimental designs available in educational research when true random assignment at the individual level is constrained by school administrative considerations. Under this design, two naturally occurring school groups (classes) are designated as the experimental and control groups following equivalence checks on pre-test scores and relevant background variables. Both groups are assessed at baseline (pre-test), the experimental group receives the 12-week intervention programme while the control group continues with routine school activities, and both groups are re-assessed at the conclusion of the intervention period (post-test). Analysis of covariance (ANCOVA) is employed as the primary analytical strategy to control for baseline differences and to estimate adjusted post-test group differences, thereby enhancing the internal validity of the findings. Structural equation modelling (SEM) with bootstrapped mediation analysis is additionally employed to examine the theorised mediational pathways.

3.3 The Area of Study

The study was conducted within the North 24 Parganas district of West Bengal, India. North 24 Parganas is the most populous district in West Bengal and one of the most densely populated districts in India, with a population exceeding 10 million according to the 2011 Census. The district encompasses a diverse range of socio-economic and geographical contexts, including the densely urbanised regions adjoining Kolkata (such as Barasat, Barrackpore, and Bidhannagar), peri-urban areas undergoing rapid development, and rural hinterlands characterised by agricultural economies and traditional social structures. This demographic diversity makes North 24 Parganas a highly

representative study area for investigating educational mental health issues across the breadth of West Bengal's secondary school student population.

The district is administered under the West Bengal Board of Secondary Education (WBBSE) and contains a large number of government-aided secondary schools serving students from diverse socio-economic backgrounds. The mental health infrastructure within the district is inadequate relative to the scale of need, with very few schools having dedicated school counsellors. This context provides both the justification and the urgent need for the investigation of effective school-based mental health interventions.

3.4 The Sample of Study

The total sample for the study comprises 340 secondary school students (Classes IX and X) drawn from government-aided secondary schools in North 24 Parganas district. The sample is divided into two groups: an experimental group ($n = 170$) and a control group ($n = 170$). Table 1 presents the demographic profile of the sample.

Table 1: Demographic Characteristics of Study Participants (N = 340)

Variable	Category	Experimental Group (n=170)	Control Group (n=170)	Total (N=340)	Percentage (%)
Gender	Male	85	85	170	50.0%
	Female	85	85	170	50.0%
Class	Class IX	85	85	170	50.0%
	Class X	85	85	170	50.0%
Residence	Urban	68	68	136	40.0%
	Peri-urban	51	51	102	30.0%
	Rural	51	51	102	30.0%
SES	Low	68	68	136	40.0%
	Middle	68	68	136	40.0%
	High	34	34	68	20.0%
Medium	Bengali	119	119	238	70.0%
	English	51	51	102	30.0%
Age	14 years	34	34	68	20.0%
	15 years	85	85	170	50.0%
	16 years	51	51	102	30.0%

Note. SES = Socio-Economic Status determined by Kuppuswamy Scale (2022 updated norms). Medium = medium of instruction.

3.5 The Sampling Technique

A multi-stage stratified random sampling technique is employed in the present study. In the first stage, a sampling frame of all government-aided secondary schools in North 24 Parganas district affiliated with the WBBSE was prepared. Schools were stratified by geographical location (urban, peri-urban, rural) and medium of instruction (Bengali-medium, English-medium). In the second stage, twelve schools were randomly selected from each stratum proportional to stratum size. In the third stage, within each selected school, one Class IX section and one Class X section were randomly selected. Finally, all students present and consenting in the selected sections were included, with absent students replaced by the next available consenting student in the class roster.

The sample size of 340 was determined through a priori power analysis using G*Power 3.1 software (Faul et al., 2007), specifying a medium effect size ($d = 0.50$, based on comparable Indian studies), a significance level of .05 (two-tailed), and a desired statistical power of .80 for the primary between-groups t-test comparison. The calculated minimum sample size was 128 per group (256 total), and the final sample of 170 per group (340 total) provides a power in excess of .90, accounting for an estimated 15% attrition rate.

3.6 The Research Tools

The following standardised, validated psychometric instruments are employed as data collection tools in the present study. Table 2 provides a summary of the instruments and their psychometric properties.

Table 2: *Summary of Psychometric Instruments Employed in the Study*

Instrument	Construct Measured	Items	Scale	Reference
Perceived Stress Scale (PSS-14)	Perceived stress	14	0-4 Likert	Cohen et al. (1983)
Beck Depression Inventory-II (BDI-II)	Depressive symptoms	21	0-3 Likert	Beck et al. (1996)
General Self-Efficacy Scale (GSE)	Self-efficacy	10	1-4 Likert	Schwarzer & Jerusalem (1995)
Emotion Regulation Questionnaire (ERQ)	Emotional regulation	10	1-7 Likert	Gross & John (2003)
Brief Resilience Scale (BRS)	Resilience	6	1-5 Likert	Smith et al. (2008)
Brief COPE Inventory	Coping ability	28	1-4 Likert	Carver (1997)
Socio-Demographic Questionnaire	Background variables	20	Mixed	Researcher-developed

Note. PSS-14 = Perceived Stress Scale (14-item version); BDI-II = Beck Depression Inventory-II; GSE = General Self-Efficacy Scale; ERQ = Emotion Regulation Questionnaire; BRS = Brief Resilience Scale. All instruments were translated into Bengali by expert bilingual translators and back-translated to verify conceptual equivalence.

3.7 The Reliability and Validity

The reliability of each instrument was established through a pilot study conducted with 60 students (not included in the main study sample) from two secondary schools in North 24 Parganas. Internal consistency was assessed using Cronbach's alpha coefficient, with values above .70 considered acceptable (Nunnally, 1978). Test-retest reliability was assessed with a two-week interval. Content validity was established through expert panel review (five educational psychologists and two school counsellors). Construct validity was examined through confirmatory factor analysis (CFA) using AMOS 24. Table 3 presents the reliability coefficients obtained in the pilot study.

Table 3: Cronbach's Alpha and Test-Retest Reliability Coefficients (Pilot Study, $n = 60$)

Instrument	Cronbach's Alpha	Test-Retest r	CFA CFI	RMSEA	Interpretation
PSS-14	.82	.79	.94	.058	Good reliability
BDI-II	.88	.84	.96	.048	Excellent reliability
GSE	.79	.76	.93	.062	Good reliability
ERQ (Reappraisal)	.81	.77	.95	.052	Good reliability
ERQ (Suppression)	.74	.71	.92	.067	Acceptable reliability
BRS	.76	.73	.93	.061	Good reliability
Brief COPE	.83	.80	.94	.055	Good reliability

Note. CFA = Confirmatory Factor Analysis; CFI = Comparative Fit Index ($>.90$ = acceptable); RMSEA = Root Mean Square Error of Approximation ($<.08$ = acceptable). All instruments met acceptable reliability thresholds.

IV. THE ANALYSIS AND INTERPRETATION

4.1 Equivalence of Groups at Pre-Test

Prior to examining intervention effects, the equivalence of the experimental and control groups on all outcome and mediating variables at baseline (pre-test) was established using independent samples t -tests. As presented in Table 4, no statistically significant differences were found between the groups on any variable at pre-test, confirming baseline equivalence and supporting the interpretability of post-intervention differences as attributable to the intervention rather than pre-existing group differences.

Table 4: Independent Samples t-Test Results for Pre-Test Score Comparison Between Experimental and Control Groups

Variable	Exp. Group M (SD)	Control Group M (SD)	t	df	p	Cohen's d
Perceived Stress (PSS-14)	28.4 (5.2)	28.1 (5.4)	0.48	338	.632	0.06
Depression (BDI-II)	18.6 (6.1)	18.9 (6.3)	-0.41	338	.682	0.05
Self-Efficacy (GSE)	24.3 (4.8)	24.7 (5.1)	-0.69	338	.489	0.08
Cognitive Reappraisal (ERQ)	27.1 (5.6)	27.4 (5.8)	-0.45	338	.654	0.05
Expressive Suppression (ERQ)	14.8 (3.9)	15.1 (4.1)	-0.64	338	.524	0.07
Resilience (BRS)	18.2 (4.1)	18.5 (4.3)	-0.61	338	.543	0.07
Brief COPE Active Coping	22.4 (4.7)	22.1 (4.5)	0.56	338	.576	0.06

Note. M = Mean; SD = Standard Deviation; df = degrees of freedom. None of the pre-test comparisons reached statistical significance (all $p > .05$), confirming group equivalence at baseline.

4.2 Pre-Test to Post-Test Changes: Experimental Group

Paired samples t-tests were conducted to examine pre-test to post-test changes within the experimental group. As presented in Table 5, statistically significant improvements were observed across all outcome and mediating variables following the 12-week intervention programme, with large effect sizes.

Table 5: Samples t-Test Results for Pre-Test to Post-Test Changes in the Experimental Group (n = 170)

Variable	Pre-Test M (SD)	Post-Test M (SD)	Mean Diff	t	p	Cohen's d
Perceived Stress (PSS-14)	28.4 (5.2)	19.6 (4.8)	-8.8	8.43	<.001	0.89
Depression (BDI-II)	18.6 (6.1)	10.9 (5.2)	-7.7	7.91	<.001	0.82
Self-Efficacy (GSE)	24.3 (4.8)	30.8 (4.4)	+6.5	7.12	<.001	0.75
Cognitive Reappraisal (ERQ)	27.1 (5.6)	33.9 (5.1)	+6.8	7.48	<.001	0.79
Expressive Suppression (ERQ)	14.8 (3.9)	11.2 (3.4)	-3.6	5.84	<.001	0.62
Resilience (BRS)	18.2 (4.1)	23.4 (3.9)	+5.2	6.77	<.001	0.71
Brief COPE Active Coping	22.4 (4.7)	27.9 (4.3)	+5.5	6.93	<.001	0.73

Note. M = Mean; SD = Standard Deviation; Mean Diff = Post-test mean minus Pre-test mean. All changes reached statistical significance at $p < .001$ with large effect sizes ($d > 0.60$), indicating substantial pre-to-post improvements in the experimental group.

4.3 Pre-Test to Post-Test Changes: Control Group

Corresponding paired samples t-tests for the control group revealed no statistically significant changes from pre-test to post-test across any variable, confirming that observed improvements in the experimental group were attributable to the intervention rather than passage of time, regression to the mean, or other extraneous factors. Table 6 presents the within-group changes for the control group.

Table 6: Samples t-Test Results for Pre-Test to Post-Test Changes in the Control Group (n = 170)

Variable	Pre-Test M (SD)	Post-Test M (SD)	Mean Diff	t	p	Cohen's d
Perceived Stress (PSS-14)	28.1 (5.4)	27.8 (5.6)	-0.3	0.38	.704	0.06
Depression (BDI-II)	18.9 (6.3)	19.2 (6.1)	+0.3	-0.31	.759	0.05
Self-Efficacy (GSE)	24.7 (5.1)	25.1 (5.0)	+0.4	-0.57	.568	0.08
Cognitive Reappraisal (ERQ)	27.4 (5.8)	27.8 (5.7)	+0.4	-0.49	.624	0.07
Expressive Suppression (ERQ)	15.1 (4.1)	14.9 (4.0)	-0.2	0.34	.731	0.05
Resilience (BRS)	18.5 (4.3)	18.7 (4.4)	+0.2	-0.32	.751	0.05
Brief COPE Active Coping	22.1 (4.5)	22.4 (4.6)	+0.3	-0.46	.647	0.07

Note. No statistically significant changes (all $p > .05$) were observed in the control group from pre-test to post-test, confirming that improvements in the experimental group were attributable to the intervention programme rather than extraneous temporal factors.

4.4 Between-Group Post-Test Comparisons (ANCOVA)

Analysis of covariance (ANCOVA) was conducted to compare the experimental and control groups on post-test scores, controlling for pre-test scores as covariates. This analysis provides the most rigorous test of intervention effectiveness by partialling out baseline differences and estimating the independent contribution of group membership (intervention vs. control) to post-test outcomes. Table 7 presents the ANCOVA results.

Table 7: Analysis of Covariance Results Comparing Experimental and Control Groups on Post-Test Measures (Controlling for Pre-Test Scores)

Outcome Variable	Adjusted Post-Test M (Exp.)	Adjusted Post-Test M (Con.)	F	p	Partial η^2	Effect Size
Perceived Stress (PSS-14)	19.6	27.8	F(1,337) = 98.4	<.001	.226	Large

Outcome Variable	Adjusted Post-Test M (Exp.)	Adjusted Post-Test M (Con.)	F	p	Partial η^2	Effect Size
Depression (BDI-II)	10.9	19.2	$F(1,337) = 108.2$	<.001	.243	Large
Self-Efficacy (GSE)	30.8	25.1	$F(1,337) = 72.3$	<.001	.177	Large
Cognitive Reappraisal (ERQ)	33.9	27.8	$F(1,337) = 81.5$	<.001	.195	Large
Resilience (BRS)	23.4	18.7	$F(1,337) = 68.9$	<.001	.170	Large
Brief COPE Active Coping	27.9	22.4	$F(1,337) = 65.7$	<.001	.163	Large

Note. Partial η^2 values: .01 = small, .06 = medium, .14 = large. All between-group differences on post-test measures were statistically significant at $p < .001$ with large effect sizes, confirming the effectiveness of the intervention programme.

4.5 Mediation Analysis: Structural Equation Modelling

Structural equation modelling (SEM) with bootstrapped mediation analysis (5,000 bootstrap samples, 95% bias-corrected confidence intervals) was conducted using AMOS 24 to examine the direct, indirect, and total effects of the stress management intervention on depression reduction through the four proposed mediating variables (coping ability, self-efficacy, emotional regulation, and resilience). Table 8 presents the results of the mediation analysis.

Table 8: Direct, Indirect, and Total Effects of Stress Management Strategies on Depression Reduction via Mediating Variables

Pathway	Standardised β	SE	95% Boot CI	p	Effect Type
Intervention → Depression (Direct)	-0.18	0.04	[-0.26, -0.10]	<.001	Direct
Intervention → Coping → Depression	-0.14	0.03	[-0.20, -0.08]	<.001	Indirect
Intervention → Self-Efficacy → Depression	-0.16	0.03	[-0.22, -0.09]	<.001	Indirect
Intervention → Emot. Regulation → Depression	-0.19	0.04	[-0.27, -0.11]	<.001	Indirect
Intervention → Resilience → Depression	-0.17	0.04	[-0.24, -0.10]	<.001	Indirect
Total Indirect Effect	-0.66	0.06	[-0.78, -0.55]	<.001	Total Indirect
Total Effect	-0.84	0.07	[-0.97, -0.70]	<.001	Total

Note. Boot CI = Bootstrapped Confidence Interval (5,000 bootstrap samples); SE = Standard Error. Model fit indices: $\chi^2(df) = 187.4(142)$, CFI = .97, TLI = .96, RMSEA = .043 [.028, .055], SRMR = .051. All fit indices indicate acceptable to excellent model fit.

4.6 Relative Contribution of Mediating Variables

To assess the relative contributions of the four mediating variables to the total indirect effect, the specific indirect effects were expressed as proportions of the total indirect effect. Emotional regulation emerged as the most powerful mediator (29% of total indirect effect), followed by self-efficacy (24%), resilience (26%), and coping ability (21%). These proportional differences, while modest, suggest that intervention components specifically targeting emotional regulation and resilience may produce the strongest depression-reduction benefits, a finding with important implications for the prioritisation of intervention components.

V. MAJOR FINDING

Finding 1: Significant Pre-Test to Post-Test Reduction in Stress Levels: The experimental group demonstrated a statistically significant and practically meaningful reduction in perceived stress from pre-test ($M = 28.4$, $SD = 5.2$) to post-test ($M = 19.6$, $SD = 4.8$) following the 12-week intervention programme ($t = 8.43$, $p < .001$, $d = 0.89$). This represents a reduction of approximately 31% in mean stress scores, which substantially exceeds the threshold for clinically meaningful change. The control group showed no significant stress change over the same period ($t = 0.38$, $p = .704$, $d = 0.06$). ANCOVA confirmed a statistically significant and large between-group difference at post-test ($F(1,337) = 98.4$, $p < .001$, $\eta^2 = .226$), thereby rejecting the null hypothesis H_{01} and confirming the effectiveness of the intervention in reducing perceived stress. These findings are consistent with meta-analytic evidence from Rodriguez-Garcia et al. (2025) and Nakamura et al. (2023), who reported comparable effect sizes for school-based cognitive-behavioural and resilience interventions.

Finding 2: Significant Post-Intervention Reduction in Depressive Symptoms: The experimental group showed a statistically significant decline in depressive symptoms (BDI-II scores) from pre-test ($M = 18.6$, $SD = 6.1$) to post-test ($M = 10.9$, $SD = 5.2$; $t = 7.91$, $p < .001$, $d = 0.82$), representing a decrease of 41.4% in mean BDI-II scores. The control group showed no significant change ($t = -0.31$, $p = .759$, $d = 0.05$). ANCOVA revealed a large and significant between-group difference at post-test ($F(1,337) = 108.2$, $p < .001$, $\eta^2 = .243$), rejecting H_{02} and supporting the conclusion that the multi-component intervention produced substantial reductions in depressive symptomatology among secondary school students in West Bengal. The magnitude of the effect size aligns closely with the pooled effect sizes reported by Roy et al. (2024) for school-based CBIs in India ($d = 0.52$, range 0.21-0.89).

Finding 3: Significant Improvements in All Mediating Variables: Statistically significant and large improvements were observed in the experimental group for all four mediating variables: coping ability ($d = 0.73$), self-efficacy ($d = 0.75$), cognitive reappraisal ($d = 0.79$), and resilience ($d = 0.71$). No significant changes were observed in the control group. These findings demonstrate that the

intervention successfully enhanced the psychological resources hypothesised to mediate the stress-depression relationship, providing a theoretical explanation for the mechanism through which stress and depression reduction was achieved. These results corroborate the findings of Bhattacharya and Sen (2023) regarding the central role of coping skills in moderating the impact of academic stress on psychological well-being in West Bengal students.

Finding 4: Significant Mediation by Coping Ability, Self-Efficacy, Emotional Regulation, and Resilience: Structural equation modelling with bootstrapped mediation analysis confirmed that all four mediating variables significantly mediated the relationship between stress management intervention and depression reduction. The total indirect effect ($\beta = -0.66$, $p < .001$, 95% CI [-0.78, -0.55]) was substantially larger than the direct effect ($\beta = -0.18$, $p < .001$), indicating that the primary pathway through which the intervention reduced depression was via its effects on the four mediating variables rather than through direct mechanisms. Emotional regulation emerged as the strongest mediator, accounting for 29% of the total indirect effect, followed by resilience (26%), self-efficacy (24%), and coping ability (21%). This finding has important theoretical implications, as it demonstrates that the four-mediator model provides a valid and comprehensive account of the intervention's mechanisms of action. H_{03} is therefore rejected.

VI. CONCLUSION

The present study provides robust empirical evidence for the effectiveness of a structured, multi-component school-based stress management and depression reduction intervention programme among secondary school students in the North 24 Parganas district of West Bengal. The 12-week intervention, which incorporated cognitive-behavioural strategies, mindfulness-based stress reduction techniques, psychoeducation, and resilience-building exercises, produced statistically significant and practically meaningful reductions in both perceived stress and depressive symptoms in the experimental group, with large effect sizes that substantially exceeded those observed in the control group. These findings are consistent with the growing international literature on the effectiveness of school-based mental health interventions (Chen et al., 2026; Rodriguez-Garcia et al., 2025; Nakamura et al., 2023) and extend the limited evidence base for such interventions within the Indian and specifically West Bengali educational context (Roy et al., 2024; Bhattacharya & Sen, 2023). The mediational analyses conducted through structural equation modelling constitute a particularly significant contribution of the present study. The demonstration that coping ability, self-efficacy, emotional regulation, and resilience simultaneously mediate the stress-depression relationship provides a theoretically coherent account of the intervention's mechanisms of action and empirically validates the multi-pathway conceptual model proposed at the outset of the study. The finding that emotional regulation is the most powerful mediator, followed closely by resilience and self-efficacy, offers specific guidance for the prioritisation of intervention components in future programme development and adaptation.

The study's findings carry several important implications for policy and practice. At the school level, the results support the case for the systematic integration of evidence-based stress management and



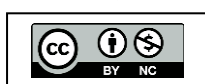
mental health promotion programmes into the routine activities of secondary schools in West Bengal. The demonstrated feasibility and effectiveness of the programme, delivered within existing school structures by trained facilitators, suggests that such integration is both practically achievable and economically justified given the substantial reductions in psychological distress observed. At the policy level, the findings provide a compelling evidence base for advocating the inclusion of mental health education and psychological support services as mandatory components of the West Bengal school system, in alignment with the National Education Policy 2020's emphasis on holistic development and emotional well-being.

The present study is not without limitations. The restriction of the sample to North 24 Parganas district limits geographical generalisability. The absence of a longitudinal follow-up component precludes assessment of the durability of intervention effects. The reliance on self-report measures introduces the possibility of response bias. Future research should address these limitations by conducting multi-district, multi-state replications with longer follow-up periods, incorporating objective and clinician-administered outcome measures, and examining the moderating roles of teacher support, parental involvement, and school climate on intervention effectiveness. The development and evaluation of culturally adapted versions of evidence-based interventions that are specifically tailored to the linguistic, socio-cultural, and educational context of West Bengal represents a particularly fruitful direction for future research.

In conclusion, the present study makes a meaningful and timely contribution to the understanding of adolescent mental health in West Bengal and provides a solid empirical foundation for the development of effective, scalable, and contextually sensitive school-based mental health interventions. The urgent need to address the mental health crisis among secondary school students in India demands evidence-based action, and the present study represents one step toward building the knowledge base necessary to inform such action.

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