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Mechanisms Of Stress Reduction: Effects Of Rajyoga Meditation On Cognitive, Emotional, And Behavioural Doimensions

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ABSTRACT

College students experience stress as a complex condition which involves multiple areas of their mental and emotional states together with their physical health and social interactions. Researchers currently study stress through combined stress metrics which fail to show how different stressors develop over time. The present study addresses this gap by examining the effects of Rajyoga meditation using a dimension-wise analytical framework.

A quasi-experimental pre-test–post-test control group design was employed with 100 college students divided into experimental and control groups. Data were analyzed using descriptive statistics, paired samples t-tests, independent samples t-tests, and Cohen's d. The experimental group participated in an 8-week Rajyoga meditation intervention, while the control group received no structured training. The researchers used descriptive statistics together with paired samples t-tests and independent samples t-tests for data analysis, while effect size estimation was conducted using Cohen's d.

The experimental group demonstrated significant reductions across all stress dimensions ($p < .001$). The change magnitude differed among domains because cognitive and emotional dimensions showed maximum decline while behavioral and physical dimensions achieved moderate progress and social stress experienced minimum transformation. The experimental group displayed significantly lower post-test stress scores when compared to the control group across all testing dimensions.

Rajyoga meditation functions primarily through internal regulatory mechanisms which include improved thought awareness and cognitive-emotional restructuring, that ultimately affect social and behavioral development. The study establishes that multidimensional analysis functions as vital component for understanding stress reduction which occurs through different processes across various domains.

KEY WORDS: Rajyoga Meditation; Multidimensional Stress; Cognitive Stress; Emotional Regulation; Quasi-Experimental Design

1. INTRODUCTION

1.1 Background

College students experience stress, which scientists now understand as a complex condition that impacts their ability to think and their emotional state and their patterns of behaviour and their ability to interact socially. Modern studies show that stress no longer exists as a single entity but instead exists across various interconnected areas. Researchers still depend on stress research to measure stress through aggregate metrics despite the field's theoretical progress because they prefer to consolidate multiple stress experiences into one total measurement.

The method of aggregation creates convenience for research needs, yet it hides critical differences in the ways stress shows itself through different aspects of human experience. People experience cognitive stress through their patterns of worry and rumination while emotional stress shows itself through anxiety and mood disturbances. Behavioral and social responses are expressed externally. These often develop more slowly than internal psychological changes. Researchers need to use composite scores because these scores restrict their capability to observe particular stress patterns and lead to incomplete comprehension of stress behaviour.

1.2 Limitation of Existing Research

Previous studies on meditation have established its effectiveness in reducing stress levels. The existing proof base shows this because researchers used complete stress assessment methods to measure stress response patterns during their tests. Through their approach, researchers create composite measurements that combine cognitive and emotional and behavioural and social elements into one measurement system, which results in testing procedures that disguise distinct patterns of development. The studies demonstrate that people who experience stress show better results, but the research fails to explain how stress reduction happens. The research needs to determine whether meditation-based interventions drive all stress response dimensions to change at the same rate or to different degrees. The current situation creates a need for advanced analysis methods which can detect responses that occur in specific areas of study.

1.3 Need for Dimension-wise Analysis

The process of assessing stress requires a dimension-based method which enables researchers to track how stress factors develop throughout time. The five dimensions of human functioning, which include cognitive, emotional, behavioral, physical and social aspects, will show different results when people undergo various types of interventions which activate different fundamental processes. The brain and emotional center of humans control their ability to perceive things and assess situations and maintain self-awareness, which leads to quick psychological transformations. People develop social and behavioural patterns through learning processes that their surroundings establish, which creates patterns that need more time for them to become used to these changes. Researchers who study these particular aspects of stress reduction can create separate stress reduction patterns which help them track how stress decreases over time.

1.4 Role of Meditation

Meditation functions as an internal regulation method because it changes how people respond to their thoughts and their emotional states. Rajyoga meditation practice requires practitioners to develop three core abilities, which include thought awareness and self-reflection and conscious cognitive control. The method enables people to monitor their thinking patterns, which helps them decrease their excessive thinking problems that include worry and rumination.

People who experience these cognitive changes will find it easier to control their emotions, which will decrease their anxiety while improving their emotional stability. The internal regulation process results in social and behavioural changes which represent the slow transformation of internal control mechanisms into social behaviour. Meditation functions as an internal regulation mechanism by altering cognitive and emotional responses, which then creates a broader impact on how people react to stress.

1.5 Objectives of the Study

The research investigates how Rajyoga meditation affects different types of stress which college students experience.

Figure 1: Objectives of the study



The study uses this method to create an understanding of Rajyoga meditation's effects on stress which offers observers a detailed understanding of these effects.

2. CONCEPTUAL FRAMEWORK

2.1 Multidimensional Model of Stress

The Multidimensional Model of Stress defines stress as a process which exists across multiple dimensions. Stress is conceptualized as an interaction among cognitive, emotional, behavioral, physical, and social domains. These five elements of human existence, create an interdependent system which affects each

element. The multidimensional approach shows how stress spreads across different domains while showing their reactions to various interventions which single-score systems cannot achieve.

2.2 Rajyoga Meditation and Internal Regulation

The process of Rajyoga meditation serves as an internal method to help individuals maintain control over their sensory perceptions instead of handling their external environment. The system requires people to watch their thoughts, which results in reduced mental patterns of worry and rumination through thought observation. The process of emotional regulation uses guided thinking with detachment, which results in decreased anxiety and tension. The body begins to show changes when internal processes reach a particular point of stabilisation. The complete procedure shows multiple stages which produce stronger cognitive and emotional effects, while their social and behavioural effects show slower progress.

2.3 Mechanism Pathway

The mechanism pathway shows that Rajyoga meditation affects stress through internal transformations which begin with awareness and reach social response through five stages. The process of thought awareness starts when people become conscious of their thoughts, which creates a mental break which enables their cognitive patterns to shift. Cognitive and emotional changes influence behavioral and physical responses. The pathway connects internal and external systems through its interactive design that maintains multiple levels of operation.

The mechanism can be summarized as follows:

Rajyoga Meditation → Thought Awareness → Cognitive Change → Emotional Regulation → Behavioral Adjustment → Social Response

Figure 2: Mechanism of Stress Reduction



3. METHODOLOGY

3.1 Research Design

The research used a quasi-experimental design with pre-test and post-test assessments together with control groups to investigate how Rajyoga meditation affects multiple stress dimensions. This design enables researchers to track progress which occurs within groups and the assessment of results which emerge after the treatment ends. The study examined five stress dimensions, which include cognitive stress, emotional stress, behavioural stress, physical stress and social stress.

Participants were divided into experimental and control groups where one group received the treatment and the other group stayed without any formal instruction. The researchers conducted pre-test assessments on both groups in order to establish baseline equivalence, and they conducted post-test assessments to measure changes that occurred after the treatment period.

3.2 Participants

The research sample included 100 college students from Imphal who were divided into two groups of 50 students each for the experimental and control groups. The study used non-random sampling methods to select their participants. The research included participants from higher education institutions who represented typical student behaviour while their individual backgrounds and stress levels were recognised.

3.3 Instrumentation

The Stress Scale (2023) serves as a standardised assessment tool that contains 30 items which use a 5-point Likert scale that ranges from 'strongly agree' to 'strongly disagree'. The scale measures five stress dimensions, which include cognitive stress, emotional stress, behavioural stress, physical stress, and social stress.

The dimension includes particular items which show different aspects of the stress experience. The instrument demonstrated acceptable reliability, which showed its ability to measure the construct with consistent internal testing results.

3.4 Dimension-wise Scoring

The present study examined stress through its five separate dimensions instead of using aggregate scoring methods. Researchers calculated scores for each domain, which included cognitive, emotional, behavioural, physical and social components, by averaging their corresponding items. The research method established specific patterns of change for various domains while testing how different stress components reacted to the intervention. Dimension-wise scoring thus provided greater analytical precision compared to total score methods.

3.5 Procedure

The study consisted of three stages, which included pre-test assessment and intervention implementation and post-test evaluation. The pre-test phase established baseline stress measurements for both study groups. The experimental group completed an eight-week Rajyoga meditation programme, while the control group received no structured training.

The intervention developed three main skills, which included thought awareness and self-reflection and cognitive control. The researchers conducted post-test evaluations after the intervention ended to measure stress level changes across all study groups.

3.6 Ethical Considerations

The research maintained compliance with ethical guidelines throughout its duration. The research team explained the study's objectives to the participants, who then provided their informed consent to take part in the research. The research team protected participant identities through confidentiality measures while using data strictly for academic research purposes.

3.7 Statistical Analysis






The researchers used both descriptive statistical methods and inferential statistical methods to analyse the data. The researchers used mean and standard deviation calculations to measure stress levels during the pre-test and post-test periods. The researchers used paired samples t-tests to evaluate changes within the groups and independent samples t-tests to compare post-test results between the experimental and control groups.

The researchers calculated gain scores to measure the extent of change while using Cohen's *d* to assess practical significance through effect size estimation. The researchers established statistical significance when *p* values reached less than .05. The researchers assessed all parametric testing assumptions, which included testing for normality and homogeneity of variance, before starting the analysis.

4. RESULTS

The research team employed descriptive statistics to assess stress levels in both the experimental group and the control group during their pre-test and post-test periods. Table 1 presents baseline and post-test stress levels across dimensions which includes both initial conditions of the study and the extent of transformations which occurred after the treatment. The experimental group achieved significant decreases in all stress dimensions through their pre-test and post-test assessments, while the control group showed only slight changes.

Table 1: Dimension-wise Descriptive Statistics (Pre-test and Post-test)

DIMENSION	GROUP	PRE-TEST MEAN	POST-TEST MEAN	MEAN CHANGE
 PHYSICAL	Experimental	22.94	19.28	-3.66
	Control	22.88	22.02	-0.86
 EMOTIONAL	Experimental	23.36	18.26	-5.10
	Control	23.18	22.28	-0.90
 COGNITIVE	Experimental	23.08	18.06	-5.02
	Control	23.46	22.20	-1.26
 BEHAVIORAL	Experimental	21.34	17.20	-4.14
	Control	21.06	20.08	-0.98
 SOCIAL	Experimental	22.94	19.62	-3.32
	Control	23.02	22.20	-0.82

4.1 Dimension-wise Pre–Post Analysis (Experimental Group)

Paired samples t-tests indicated significant reductions across all dimensions (see Table 2). The strongest decreases occurred in cognitive and emotional areas because people showed reduced levels of worry and emotional distress. The study found that all dimensions showed improvement, but the degree of progress varied between behavioural and social aspects of the study.

Table 2: Paired Samples t-test for Dimension-wise Stress (Experimental Group)

DIMENSION	t t-VALUE	df df	p p-VALUE	SIGNIFICANCE
PHYSICAL	11.664	49	< 0.001	✓ SIGNIFICANT
EMOTIONAL	18.101	49	< 0.001	✓ SIGNIFICANT
COGNITIVE	19.584	49	< 0.001	✓ SIGNIFICANT
BEHAVIORAL	14.007	49	< 0.001	✓ SIGNIFICANT
SOCIAL	10.910	49	< 0.001	✓ SIGNIFICANT

The results from Table 2 demonstrate important stress relief across all tested stress factors. The cognitive and emotional domains show the strongest impacts while behavioural and physical dimensions display moderate effects and social dimension shows the least impact.

4.2 Comparative Improvement Across Dimensions

The dimensions show non-uniform progress because the comparison of dimensional changes demonstrates this finding (see Table 3). The emotional and cognitive domains show the greatest decrease because they demonstrate major alterations of internal functions. The social dimension experiences the smallest development, whereas behavioural and physical dimensions show their growth at a moderate pace. The research shows that internal domains experience higher effects while external aspects show less change.

Table 3: Dimension-wise Mean Reduction (Gain Score Analysis – Experimental Group)

DIMENSION	MEAN REDUCTION	SD	RANK
EMOTIONAL	5.10	1.99	1 (Highest)
COGNITIVE	5.02	1.81	2
BEHAVIORAL	4.14	2.09	3
PHYSICAL	3.66	2.22	4
SOCIAL	3.32	2.15	5 (Lowest)

The results presented in Table 3 show that emotional and cognitive dimensions experienced their largest decreases while social and physical dimensions showed smaller changes. Rajyoga meditation produces

greater effects on internal stress dimensions because these dimensions develop at a slower rate than social and behavioural aspects.

4.3 Control Group Comparison

The control group showed statistically significant but minimal changes, indicating limited practical significance rather than meaningful improvement. Slight variations were observed in cognitive and emotional dimensions, while physical and social domains remained largely stable. These changes likely reflect normal fluctuations rather than actual progress. In contrast, the experimental group demonstrated substantial reductions across all stress dimensions, indicating the effect of the intervention.

4.4 Between-Group Comparison

The experimental group demonstrated lower stress levels than the control group through independent samples t-tests, which examined all stress dimensions (see Table 4). The cognitive and emotional areas showed the highest differences between groups, while the physical and behavioural areas displayed moderate distinctions. The social dimension showed different results, but the changes were less significant than in other dimensions.

Table 4: Independent Samples t-test (Post-test Comparison between Experimental and Control Groups)

DIMENSION	EXPERIMENTAL MEAN	CONTROL MEAN	t t-VALUE	df df	p-VALUE	SIGNIFICANCE
PHYSICAL	19.28	22.02	-4.144	98	< 0.001	SIGNIFICANT
EMOTIONAL	18.26	22.28	-5.873	98	< 0.001	SIGNIFICANT
COGNITIVE	18.06	22.20	-6.227	98	< 0.001	SIGNIFICANT
BEHAVIORAL	17.20	20.08	-4.219	98	< 0.001	SIGNIFICANT
SOCIAL	19.62	22.20	-3.718	98	< 0.001	SIGNIFICANT

The experimental group achieved better stress reduction results than the control group in all tested dimensions, which led to higher stress reduction scores for the experimental group. The most pronounced differences between the two groups occurred in the cognitive and emotional domains of assessment, which demonstrated stronger effects on internal processes.

4.5 Effect Size per Dimension

Researchers used Cohen's d measurement method to determine effect sizes because it enabled them to study three separate aspects of change. The research revealed that cognitive and emotional domains produced extremely large effects, while behavioural and physical dimensions resulted in large effects. The social dimension showed the smallest effect size, which stayed within the large range because all domains exhibited changes at various levels of strength.

Table 5: Effect Size (Cohen's *d*) for Dimension-wise Stress Reduction (Experimental Group)

 DIMENSION	 COHEN'S <i>d</i>	 INTERPRETATION
 PHYSICAL	-1.650	LARGE ★
 EMOTIONAL	-2.560	VERY LARGE ★★
 COGNITIVE	-2.770	VERY LARGE ★★
 BEHAVIORAL	-1.981	LARGE ★
 SOCIAL	-1.543	LARGE ★

The data from Table 5 demonstrate that cognitive and emotional dimensions showed the most significant results, while behavioural dimensions and physical dimensions and social dimensions displayed smaller yet important results. The research demonstrates that Rajyoga meditation most effectively reduces internal stress, which subsequently causes external stress symptoms to develop at a slower pace. The difference between statistical significance and practical significance forms a crucial element for understanding how interventions produce their effects.

5. DISCUSSION

5.1 The Different Effects of Rajyoga

The findings indicate that Rajyoga meditation produces differential effects across stress dimensions rather than uniform reduction and the findings should be interpreted within the context of the quasi-experimental design. Although significant decreases were observed in all domains, the magnitude of change was greater in cognitive and emotional dimensions compared to behavioral, physical, and social domains. This pattern suggests that the intervention primarily influences internal regulatory processes related to thought patterns and emotional responses. The stronger effects in cognitive and emotional domains, reflected in higher *t*-values and larger effect sizes, support this interpretation. In contrast, behavioral and social dimensions showed comparatively smaller changes, likely due to their dependence on established habits, environmental conditions, and interpersonal factors. The physical dimension demonstrated moderate improvement, which may reflect indirect effects arising from prior cognitive and emotional changes. Overall, the results suggest that internal aspects of stress respond more rapidly to intervention, while external manifestations require a longer period to show noticeable change.

5.2 Mechanism Explanation

The stress reduction effect of Rajyoga meditation shows that its meditation practitioners experience internal development through their meditation practice. The intervention starts with cognitive awareness development because it helps participants learn to monitor and control their thinking processes. The demonstration shows that this cognitive shift leads to an observable decrease in maladaptive thinking patterns, which include worry and rumination.

As individuals become more aware of their thought processes, corresponding changes in emotional responses begin to emerge, including reduced anxiety and improved emotional regulation. The relationship between cognitive and emotional change appears to be non-linear, with both processes often developing

simultaneously and influencing one another. In some instances, cognitive restructuring facilitates emotional control, while in others, cognitive and emotional changes evolve together.

Changes in behavioral and social domains tend to occur more gradually over time. These domains are shaped not only by internal regulation but also by established habits, environmental influences, and interpersonal contexts, which may delay observable change. Improvements in physical symptoms appear to follow sustained regulation of cognitive and emotional processes, suggesting that physiological outcomes are indirectly influenced by prior internal changes.

The change mechanism operates as a continuous process because it establishes a closed-loop system. Internal processes start and maintain change while external manifestations gradually align with these internal shifts over time.

5.3 Rajyoga as an Internal Regulation System

The findings support the conceptualization of Rajyoga meditation as an internal self-regulation system. Unlike behavior-focused interventions, Rajyoga primarily operates through cognitive processes that enhance awareness and regulation of thought patterns. Through practices centered on thought awareness and reflective observation, individuals develop the ability to create psychological distance from immediate reactions. This distancing facilitates more adaptive interpretation of experiences and improved emotional control, thereby reducing the intensity of stress responses.

The stronger effects observed in cognitive and emotional domains highlight the central role of internal regulation in stress reduction. Changes in these domains appear to initiate broader transformations, which gradually extend to behavioral and social functioning. In this sense, Rajyoga meditation can be understood as a process of cognitive–emotional restructuring that influences multiple aspects of functioning beyond simple coping.

These findings are consistent with existing research on meditation and stress reduction, which identifies attention regulation, cognitive restructuring, and emotional control as key mechanisms. Studies on mindfulness and related practices similarly report significant reductions in psychological stress, attributed to enhanced awareness and improved regulation of internal processes.

At the same time, much of the previous research has relied on aggregate measures of stress, limiting the ability to detect domain-specific patterns of change. The present study extends this literature by demonstrating that stress reduction is not uniform across domains. Cognitive and emotional dimensions show greater responsiveness, whereas behavioral and social domains tend to develop more gradually.

The results also align with cognitive appraisal frameworks, particularly the work of Richard Lazarus, which emphasizes the role of thought processes in shaping emotional and behavioral responses to stress. By influencing cognitive appraisal, Rajyoga meditation appears to alter how stressors are perceived and managed, leading to broader reductions in stress. Overall, the findings underscore the importance of multidimensional analysis in understanding stress reduction as a domain-specific and process-oriented phenomenon.

6. CONCLUSION

The present study demonstrates that stress is a multidimensional phenomenon encompassing cognitive, emotional, behavioural, physical, and social domains, each responding differently to intervention. Although these domains are interrelated, they exhibit distinct patterns of change, highlighting the importance of dimension-wise analysis.

Rajyoga meditation was found to produce the most substantial reductions in cognitive and emotional dimensions, indicating that the intervention primarily operates through internal regulatory mechanisms

involving thought awareness and emotional control. These internal changes appear to initiate broader transformations that gradually extend to behavioural, physical, and social domains.

The findings suggest that Rajyoga meditation functions as a process of cognitive–emotional restructuring, enabling individuals to manage stress more effectively and improving overall functioning. Stress reduction, therefore, should be understood as a layered process that unfolds across multiple domains rather than as a uniform outcome.

From a practical perspective, the study provides evidence for the integration of meditation-based interventions within educational settings to support student mental health. Rajyoga meditation offers a feasible and scalable approach by addressing stress at its cognitive and emotional foundations. These findings support the integration of meditation-based interventions into educational mental health frameworks. Rajyoga meditation supports stress regulation through cognitive–emotional pathways, with broader effects emerging over time.

7. LIMITATIONS

- The research only studied Imphal college students because the researchers used this sample, which limited their ability to apply their findings to other demographic groups and different geographic areas.
- The study ended after eight-week intervention because researchers did not conduct follow-up assessments; thus, they could not determine whether participants maintained their observed effects throughout time.
- The use of self-report measures may introduce response bias because participants will interpret items differently while providing socially desirable responses.
- The quasi-experimental design which researchers used for intervention studies lacks complete randomization because it allows extraneous variables to impact study outcomes.
- The study results show distinct patterns of change which require cautious interpretation because the findings do not apply to all situations and time frames.

8. FUTURE DIRECTIONS

- ✓ The future research should implement longitudinal design to understand the decline in stressful events following an eight-week Rajyoga treatment regimen.
- ✓ Studies should include diverse samples across regions and academic disciplines and cultural contexts to enhance the generalisability of their findings.
- ✓ Further research is needed to explore the underlying mechanisms of stress reduction, especially through the combined study of psychological and physiological measures which include heart rate variability and biomarkers.
- ✓ The use of randomised controlled trials (RCTs) is recommended because it helps researchers establish causal relationships while decreasing the effects of external factors.
- ✓ Mixed-method research designs which combine quantitative and qualitative approaches will help researchers better understand the measurable results and personal experiences that people have when they practise meditation.

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