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Effects of Yoga and Combined Yoga with Neuro-Linguistic Programming on Psychological Management in Mothers of Adolescents: A Randomized Controlled Trial

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Abstract

Adolescent parenting presents significant challenges for mothers, often leading to elevated levels of stress and anxiety that can adversely affect their well-being and parenting effectiveness. This study aims to evaluate the efficacy of yoga alone and in combination with Neuro-Linguistic Programming (NLP) in managing stress and anxiety among mothers of adolescent children. In this randomized controlled trial, 90 participants aged 35-55 years (mean age 44.56±4.58 years), each with at least one child aged 13-19 years, were randomly assigned to one of three groups: control, yoga, or yoga with NLP. Interventions were conducted over 12 weeks, with outcome measures assessed pre- and post-intervention by trained research assistants blinded to group allocation. The Depression, Anxiety, and Stress Scale (DASS-21), and Pittsburgh Sleep Quality Index (PSQI), were utilized to evaluate outcomes. Both intervention groups demonstrated significant reductions in depression, anxiety, and stress levels compared to the control group. The yoga with NLP group exhibited superior improvements across all primary outcomes, with statistically significant differences noted in depression (mean difference =7.1, p<0.001), anxiety (mean difference =5.1, p<0.001) and stress levels (mean difference =5.5, p<0.001). Additionally, sleep quality improved significantly in both intervention groups, with the yoga with NLP group showing greater benefits. This study provides evidence that yoga, particularly in combination with NLP, is an effective non-pharmacological approach for reducing stress and anxiety and improving sleep quality among mothers of adolescents. These findings support the integration of mind-body practices into mental health care, highlighting the potential synergistic benefits of combining physical and cognitive interventions. Future research should explore long-term effects and the mechanisms underlying these improvements.

Keywords: yoga, neuro-linguistic programming, adolescent, depression, stress

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Introduction

Adolescent parenting presents significant challenges for mothers, often leading to elevated levels of stress and anxiety that can adversely affect their well-being and parenting effectiveness (Charan & Kumar, 2024; Cowling & Van Gordon, 2022; Sharma & Sharma, 2024). Mothers of adolescents experiencing high stress and anxiety may struggle to support their children while managing personal and professional responsibilities (Erfina et al., 2019; Fegert et al., 2020). This can result in ineffective parenting, family conflicts, and strained mother-child relationships (Dotterer et al., 2021). Therefore, there is a critical need for effective interventions to help mothers manage stress and anxiety, thereby improving their quality of life and overall well-being (Shorey et al., 2023).

Yoga is a holistic practice that integrates physical postures, breathing exercises, and mindfulness meditation to enhance physiological and psychological well-being (Charan & Kumar, 2024; Jagadeesan et al., 2022; Mitra, 2023). Multiple studies have demonstrated yoga's ability to reduce stress, anxiety, and depression across various populations, making it a popular choice for stress management (Maheshkumar et al., 2021; Padmavathi et al., 2023; Wang & Szabo, 2020). Beyond physical fitness, yoga promotes mental clarity, emotional stability, and a balanced quality of life by focusing on mindful breathing and providing a natural counterbalance to the stress response (Ong Gaffney et al., 2023; Yan, 2024).

Simultaneously, Neuro-Linguistic Programming (NLP) is a psychological technique that analyzes the relationship between neurological function, language, and behavioral responses (Irsyad & Casmini, 2023; Mehdi et al., 2022). NLP aims to enhance personal efficiency by helping individuals identify their personality traits and alleviate unproductive thoughts and behaviors (Lemieux, 2020). Techniques such as anchoring, cognitive remodeling, and stress management are implemented to promote emotional stability, interpersonal skills, and problem-solving capacity (Gran, 2021; Liff et al., 2024). While NLP has been applied in various contexts like therapy, coaching, and personal development, its potential in combination with yoga remains underexplored (Passmore & Rowson, 2019).

The combined nature of yoga and NLP, where yoga provides physical and mental ease while NLP offers tools for cognitive and emotional restructuring, provides a strong rationale for integrating these practices to improve stress and anxiety management (Akdeniz & Kaştan, 2023; Ybias et al., 2024). Yoga has been shown to alleviate stress and reduce depressive symptoms by posi-

tively impacting inflammatory markers, autonomic balance, neurotransmitters, and the HPA axis, making it an ideal complementary therapy for mental health disorders, particularly when used alongside conventional treatments (Martínez-Calderon et al., 2023; Padmavathi et al., 2023). Previous studies also reported that NLP is effective in reducing psychological distress for the patients with various health conditions (Doğan et al., 2022). However, studies on the combined benefits of yoga and NLP, particularly among mothers of adolescents, are sparse. Understanding whether the combination of NLP with yoga can provide additional benefits beyond those achieved through yoga alone is crucial for developing more comprehensive and effective treatments.

This randomized controlled study aims to examine the effects of yoga alone and in combination with NLP on stress and anxiety management in mothers of adolescent children.

Methods

Study design and participants

This randomized controlled trial investigated the effects of yoga and combined yoga with Neuro-Linguistic Programming (NLP) on stress and anxiety management in mothers of adolescent children. The study enrolled 90 participants, aged 35-55 years, (mean age 44.56 ± 4.58 years), each with at least one child between 13-19 years old. Participants were randomly assigned (Figure 1) to one of three groups: control, yoga, or yoga with NLP, with 30 individuals per group, using a lottery method (See Figure 1). The study received approval from the Ethics Committee at Meenakshi Academy of Higher Education & Research in Tamil Nadu (Approval No. MMCH&RI IEC/PhD/02/JAN/2023). All study procedures adhered to the most recent version of the Declaration of Helsinki.

Sample size calculation

The sample size was determined using G*Power software version 3.1.9.2 (Kang, 2021). The calculation was based on a one-way ANOVA with three groups, assuming a medium effect size (f=0.50), an alpha level of 0.05, and a desired power of 0.80. To account for potential dropouts and ensure adequate power for subgroup analyses, the researchers increased the sample size by approximately 20%, resulting in a total target sample of 90 participants, with 30 individuals allocated to each of the three groups.

Inclusion and exclusion criteria

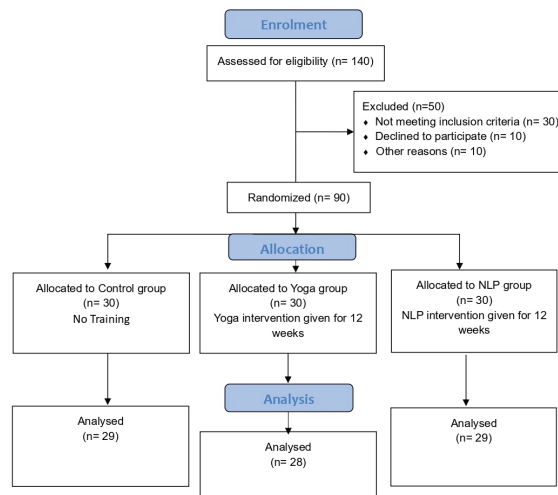Inclusion criteria required participants to understand

FIGURE 1. CONSORT Flow Chart

and follow instructions in the local language and to be willing to participate for the full study duration. Exclusion criteria included prior experience with yoga or NLP, current participation in other stress management programs, diagnosed psychiatric disorders requiring medication, and physical conditions that would interfere with yoga practice.

Interventions

Yoga Group: Participants in the Yoga Group engaged in 60-minute sessions three times weekly for 12 weeks. The yoga program included a variety of loosening exercises, asanas, pranayama, and meditation techniques. Loosening exercises consisted of Cat-Cow Breathing, Vaksha Sakti Vikasha, and Surya Namaskarasana from the Bihar School of Yoga tradition, followed by Sashangasana (Child Pose), Ustrasana, Matsyasana, Setubandhasana, Bhujangasana, and Makarasana to enhance flexibility and spinal mobility. Pranayama practices focused on Shithali, Bhramari, and Nadi Suddhi, while mental chanting of A-U-M was also incorporated (Jagadeesan et al., 2021; Kuppusamy et al., 2020; Rajagopalan et al., 2023; Thanalakshmi et al., 2020).

Yoga with NLP Group: This group received the same yoga program as above, supplemented with weekly 90-minute NLP sessions for 12 weeks. The NLP program emphasized cognitive restructuring, stress management techniques, and communication skills to enhance parenting competence (See Table 1).

Table 1. Intervention details for Yoga and NLP program

Training Component	Duration	Frequency
Loosening Exercises		
Cat-Cow Breathing	5 minutes	3 times/week
Vaksha Sakti Vikasha	5 minutes	3 times/week
Surya Namaskarasana	10 minutes	3 times/week
Asanas		
Sashangasana (Child	5 minutes	3 times/week
Ustrasana	5 minutes	3 times/week
Matsyasana	5 minutes	3 times/week
Setubandhasana	5 minutes	3 times/week
Bhujangasana	5 minutes	3 times/week
Makarasana	5 minutes	3 times/week
Pranayama|	5 minutes	3 times/week
Shithali Pranayama|	5 minutes	3 times/week
Bhramari Pranayama	5 minutes	3 times/week
Nadi Suddhi	5 minutes	
Meditation		
A-U-M Chanting	10 minutes	3 times/week
NLP Techniques		
Anchoring	30 minutes	1 times/week
De-Busting	30 minutes	1 times/week
Swish	30 minutes	1 times/week

Control Group: Participants in this group received no intervention but were offered the opportunity to participate in yoga and NLP sessions after the study's completion.

Procedure

Prior to the 12-week intervention, participants in both active groups attended two 90-minute familiarization sessions to introduce basic concepts, demonstrate techniques, and address questions. All participants received structured log books to record daily stress levels, significant parenting-related events, and the practice of techniques outside scheduled sessions. The yoga and yoga with NLP groups also logged their session attendance. These log books were collected and reviewed biweekly by the research team to monitor compliance, gather qualitative data, and encourage participant engagement and self-reflection throughout the study period.

Outcome parameters

This study employed three different scales to assess stress, anxiety, sleep quality, and quality of life among participants.

Depression, Anxiety, and Stress Scale (DASS-21): The DASS-21 is a widely used self-report questionnaire designed to assess symptoms of depression, anxiety, and stress over the past week. It consists of 21 items, with scoring calculated by summing the relevant items and multiplying by two to align with the full-scale version. Higher scores indicate increased levels of depression, stress and anxiety (Medvedev, 2023).

Pittsburgh Sleep Quality Index (PSQI): The PSQI is a self-report questionnaire that evaluates sleep quality and disturbances over the past month. It comprises 19 items organized into seven components: sleep duration, sleep disturbances, sleep latency, daytime dysfunction, sleep effectiveness, sleep quality, and frequency of sleep medication use. The global score ranges from 0 to 21, with scores above 3 indicating

worse sleep quality and scores above 5 reflecting poor sleep quality (Zitser et al., 2022).

Data collection and analysis

Demographic data were collected at baseline, and all outcome measures were assessed pre- and post-intervention by trained research assistants who were blinded to group allocation. Data analysis was conducted using SPSS version 25.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were calculated for all variables, while between-group differences were analyzed using one-way ANOVA for continuous variables followed by post hoc TukeyHSD test. Statistical significance was set at p<0.05.

Results

A total of 90 mothers of adolescent children, aged 35-55 years (mean age 44.56±4.58 years), participated in this study. Baseline demographic characteristics and initial scores on outcome measures were comparable across all groups, with no statistically significant differences observed (Table 2).

Table 2. Baseline demographical details of the study participants

Characteristic	Overall N = 90	Control N = 30	Yoga N = 30	Yoga with NLP N = 30	p-value
Age (yrs)	44.38 (5.14)	44.03 (2.86)	43.90 (3.01)	45.20 (7.92)	>0.9
Height (cm)	153.41 (4.03)	154.03 (4.05)	153.00 (3.84)	153.20 (4.26)	0.5
Weight (kg)	68.58 (8.73)	69.54 (10.13)	67.46 (7.90)	68.73 (8.15)	0.8
Qualification					0.9
Degree and above	54 (60%)	18 (60%)	18 (60%)	18 (60%)	
Graduate	33 (37%)	12 (40%)	11 (37%)	10 (33%)	
HSC	3 (3.3%)	0 (0%)	1 (3.3%)	2 (6.7%)	
Occupation					>0.9
House wife	9 (10%)	2 (6.7%)	4 (13%)	3 (10%)	
Private sector	52 (58%)	19 (63%)	16 (53%)	17 (57%)	
Public sector	10 (11%)	3 (10%)	3 (10%)	4 (13%)	
Self Employed	19 (21%)	6 (20%)	7 (23%)	6 (20%)	

Analysis of the primary outcomes revealed significant improvements in depression, stress and anxiety levels among participants in the intervention groups (Table 2). The yoga group demonstrated a substantial decrease in depression scores (mean difference [MD]=5.8, 95% CI [-7.2 to -4.4], p<0.001) compared to the control group. The yoga with NLP group exhibited an even more pronounced reduction in depressive symptoms (MD=7.7, 95% CI [-9.1 to -6.3], p<0.001) relative to the control group. Moreover, the comparison between the two intervention groups showed that the yoga with NLP group achieved a significantly greater reduction in depression scores than the yoga-only group (MD=1.5, 95% CI [-2.9 to -0.1], p=0.038). Stress levels, as measured by the DASS-21 Stress subscale, showed a marked decrease in both the yoga group (mean difference [MD]=4.1, 95% CI [-5.3 to -2.9], p<0.001) and the yoga with NLP group ([MD]=5.5, 95% CI [-6.7 to -4.3],

Table 3. Comparison of baseline outcome parameters between the groups

	Control Group	Yoga Group	Yoga + NLP Group	P value
DAS 21- Depression				
Pre-intervention	22.4 ± 5.2	23.1 ± 4.9	22.8 ± 5.1	0.23
Post-intervention	21.9 ± 5.3	17.3 ± 4.2	15.1 ± 3.8	0.001
Mean change (95%CI)	0.5 (-0.6 to -0.13)	5.8 (-7.2 to -4.4)	7.7 (-9.1 to -6.3)	
DASS 21- Stress				
Pre-intervention	15.7 ± 4.1	16.2 ± 3.8	15.9 ± 4.0	0.55
Post-intervention	15.3 ± 4.2	12.1 ± 3.3	10.4 ± 2.9	0.001
Mean change	0.4 (-1.5 to 0.7)	4.1 (-5.3 to -2.9)	5.5 (-6.7 to -4.3)	
DASS 21 Anxiety				
Pre-intervention	18.5 ± 4.8	19.0 ± 4.5	18.7 ± 4.6,	0.23
Post-intervention	18.1 ± 4.7	14.6 ± 3.9	12.8 ± 3.5	0.001
Mean change	0.2 (-0.9 to 0.5)	3.7 (-5.3 to -2.1)	5.1 (-6.7 to -3.5)	
PSQI				
Pre-intervention	8.9 ± 2.3	9.1 ± 2.1	9.8 ± 2.2	0.88
Post-intervention	8.7 ± 2.4	7.8 ± 1.9	6.9 ± 1.7	0.001
Mean change	0.5 (-0.7 to -0.4)	2.1 (-3.0 to -1.2)	2.7 (-3.6 to -1.8)	

p<0.001) compared to the control group (Figure 2). The yoga with NLP group demonstrated a greater reduction in stress levels compared to the yoga-only group, and this difference was statistically significant (MD=1.9, 95% CI [-3.7 to -0.1], p=0.03).

Similarly, anxiety levels assessed using the DASS-21 Anxiety subscale significantly decreased in both intervention groups. The yoga group showed a reduction of 3.7 points (95% CI [-5.3 to -2.1], p<0.001), while the yoga with NLP group demonstrated a more pronounced decrease of 5.1 points (95% CI [-6.7 to -3.5], p<0.001) compared to the control group. The difference in anxiety reduction between the two intervention groups was statistically significant (MD=1.4, 95% CI [-2.8 to -0.1], p=0.041) (Table 3).

Secondary outcomes also showed promising results (Figure 3). Sleep quality, as measured by the PSQI, improved significantly in both intervention groups compared to the control group. The yoga group's PSQI scores decreased by 2.1 points (95% CI [-3.0 to -1.2], p<0.01), while the yoga with NLP group showed an even greater improvement with a reduction of 2.7 points (95% CI [-3.6 to -1.8], p<0.001). The difference between the two intervention groups was not statistically significant (MD=0.6, 95% CI [-1.3 to 0.1], p=0.089). Adherence to the interventions was high, with 90% of participants in the yoga group and 93% in the yoga with NLP group attending at least 80% of the scheduled sessions. No serious adverse events were reported during the study period.
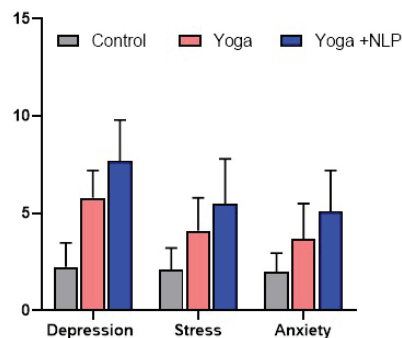

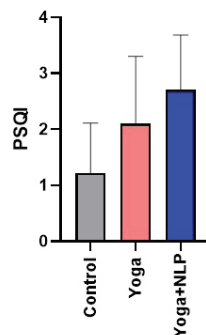FIGURE 2. Changes in DASS 21 after the intervention among the groups

FIGURE 3. Changes in PSQI after the intervention among the groups

Discussion

In this randomized clinical trial involving 90 mothers of adolescent children, we found that both yoga and yoga combined with Neuro-Linguistic Programming (NLP) interventions significantly reduced symptoms of depression, anxiety, and stress compared to a control group. The combined yoga and NLP intervention demonstrated superior efficacy across all primary outcomes. Additionally, both intervention groups showed significant improvements in sleep quality, a key secondary outcome.

These findings suggest that yoga, either alone or in combination with NLP, may be an effective non-pharmacological approach for improving mental health and sleep quality in middle-aged mothers. The more pronounced improvements observed in the yoga with NLP group indicate that the integration of cognitive techniques with physical practice may offer synergistic benefits.

Our results align with previous meta-analytic findings that have demonstrated the efficacy of yoga in reducing symptoms of depression, anxiety, and stress (Breedvelt et al., 2019). They included 23 randomized controlled trials, encompassing 1,373 participants, to examine the effects of meditation, yoga, and

mindfulness on depression, anxiety, and stress in tertiary education students. Findings revealed moderate overall effects (g=0.42-0.46) onhese symptoms. However, it's important to note that these effects diminished substantially when compared to active controls (g=0.13). The authors emphasized caution in interpreting these results, as most included studies had a high risk of bias, lacked safety reporting, and rarely assessed academic achievement.

However, to our knowledge, this is the first randomized controlled trial to examine the combined effects of yoga and NLP on mental health outcomes in this specific population. The magnitudes of improvement observed in our study are comparable to or exceed those reported in meta-analyses of yoga interventions for mental health.

Several mechanisms may underlie the observed benefits. Yoga has been shown to modulate the hypothalamic-pituitary-adrenal (HPA) axis and reduce inflammation, both of which are implicated in the pathophysiology of depression and anxiety (Padmavathi et al., 2023). NLP techniques, on the other hand, may enhance cognitive restructuring and coping skills, potentially explaining the additive benefits observed in the combined intervention group (Ybias et al., 2024).

The improvements in sleep quality are particularly noteworthy, given the bidirectional relationship between sleep disturbances and mental health issues. Better sleep may have contributed to the observed improvements in mood and stress levels, and vice versa (Turmel et al., 2022).

A recent quasi-experimental study investigated the impact of hatha yoga on mental health in a group of 52 Iranian women, with an average age of 33.5 years. The participants engaged in a month-long program consisting of three weekly yoga sessions, each lasting 60-70 minutes. Using the DASS-21 scale to measure psychological symptoms, the researchers found significant improvements in depression, anxiety, and stress levels following the intervention (P<0.001) (Khunti et al., 2023).

A pilot study evaluated the impact of an 8-week mindful parenting intervention (MPI) on parents of young children with anxiety disorders. The study involved 21 parents whose children were between 3 and 7 years old. Findings revealed significant (P<0.05) improvements in mindful parenting practices and notable decreases in problematic parent-child interactions. The results suggest that the MPI may be a promising approach for improving parenting skills and family dynamics in families dealing with childhood anxiety (Farley et al., 2023). This present study extends these findings by demonstrating the enhanced benefits of combining yoga with NLP techniques.

A systematic review by Nompo et al. (2021) found that Neuro-Linguistic Programming (NLP) interventions can effectively reduce anxiety across different populations and contexts (Nompo et al., 2021). Multiple studies showed that NLP techniques, including reframing, anchoring, rapport building, and modeling, helped lessen anxiety symptoms and encourage positive behavioral changes (Kotera et al., 2019). The NLP interventions were typically delivered through multi-session training programs lasting between 2 to 12 weeks. These programs often included components such as identifying sensory preferences, building rapport, reframing negative thoughts, and practicing new cognitive and communication strategies. The benefits of these NLP interventions were not limited to anxiety reduction. Improvements were also noted in participants' self-confidence, communication skills, and overall mental health (Nompo et al., 2021; Shirazi & Kahrazei, 2022).

This study has several limitations. First, the relatively small sample size and short duration of follow-up limit the generalizability of our findings. Second, the use of self-report measures, while validated, may introduce some bias. Third, the lack of an active control group (e.g., exercise only) makes it difficult to isolate the specific effects of yoga and NLP. Finally, the high adherence rates observed may not be representative of real-world settings.

Nevertheless, these findings have important implications for clinical practice and public health. Given the high prevalence of mental health issues among middle-aged women and the potential side effects of pharmacological treatments, yoga and NLP could be considered as adjunctive or alternative therapies in this population. The superior efficacy of the combined intervention suggests that integrating mind-body practices with cognitive techniques may be a promising approach for comprehensive mental health care.

Future research should focus on longer-term follow-up, larger sample sizes, and comparison with other active interventions. Additionally, exploring the underlying neurobiological mechanisms and identifying patient characteristics that predict treatment response would be valuable for personalizing interventions.

Conclusion

In conclusion, this study provides evidence for the efficacy of yoga and yoga combined with NLP in improving mental health and sleep quality among mothers of adolescents. These findings support the integration of mind-body practices into mental health care and highlight the potential synergistic benefits of combining physical and cognitive interventions.

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