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Gender differences in response to multi-component yoga therapy for insomnia and psychological issues: A randomised controlled study

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Abstract

It is the purpose of this randomised controlled trial to investigate the gender variations that exist in the responses to Multi-Component Yoga (MCY) therapy for the treatment of insomnia and other related psychological disorders, such as anxiety and depression. An MCY intervention that lasted for eight weeks was carried out on a total of 120 participants, with males and females sharing an equal number of participants. Validated scales such as the Pittsburgh Sleep Quality Index (PSQI), the Insomnia Severity Index (ISI), the State-Trait Anxiety Inventory (STAI), and the Beck Depression Inventory (BDI) were utilised in order to assess the quality of sleep, the severity of insomnia, anxiety, and depressive symptoms. The findings showed that both males and females experienced significant increases in the quality of their sleep as well as reductions in the intensity of their occurrence of insomnia. There were no discernible differences between the two groups. Nevertheless, as compared to males, girls showed much higher reductions in the symptoms of anxiety and depression throughout the study. Based on these findings, it appears that MCY therapy is similarly beneficial for controlling insomnia in both males and females, although it may offer additional psychological benefits to females.

Keywords: Multi-component yoga, insomnia, gender differences, sleep quality, anxiety, depression, randomised controlled trial, non-pharmacological therapy, mind-body practices

1. Introduction

1.1 Insomnia as a Prevalent Sleep Disorder

The inability to get asleep, to remain asleep, or to achieve restorative sleep is the defining characteristic of insomnia, which is a prevalent sleep condition that affects people of all ages and ethnicities. Not only does it cause disruptions in sleep, but it also has an effect on daytime functioning, emotional stability, and cognitive performance (Riemann *et al.*, 2015) ^[15]. The likelihood of women experiencing insomnia is 1.4 times higher than that of males, according to research conducted by Zhang and Wing (2006) ^[23]. This indicates that women are more susceptible to the condition than men. According to Mallampalli and Carter (2014) ^[13], this gender disparity is caused by a number of factors, including hormonal shifts, the weight of caregiving responsibilities, and an increased prevalence of anxiety and despair. Hormonal fluctuations, particularly during menstruation, pregnancy, and menopause, significantly affect women's sleep patterns. For example, during pregnancy and menopause, women often experience

increased sleep disruptions due to physical discomfort, night sweats, and hot flashes (Kravitz *et al.*, 2003) ^[11].

1.2 Psychological Issues and Insomnia

There is a strong correlation between sleeplessness and psychological problems, notably those of worry and sadness. Insomnia frequently makes symptoms of anxiety and depression worse, and these psychological problems, in turn, lead to sleep difficulties (Baglioni *et al.*, 2011) ^[1]. This association extends in both directions, as insomnia frequently exacerbates feelings of anxiety and depression. As a consequence of the fact that women are more prone to suffer from insomnia than men, the researchers McLean *et al.* (2011) ^[14] found that women experience higher rates of anxiety and sadness than males. These mental health concerns in women are further compounded by hormonal shifts and the expectations that society places on them, rendering them especially vulnerable to both psychological anguish and sleep disturbances. People who suffer from anxiety may find it challenging to relax and fall asleep due

to the cognitive hyperarousal that is linked with the condition. According to Sivertsen *et al.* (2012)^[18], anxiety frequently takes the form of excessive worrying and ruminating in females, which further disrupts their ability to sleep.

1.3 Multi-Component Yoga (MCY) Therapy

Recently, Multi-Component Yoga (MCY) treatment has developed as a non-pharmacological intervention that has proven to be beneficial in treating insomnia and the psychological disorders that are connected with it. This holistic approach to addressing stress, anxiety, and sleep disruptions is offered by MCY, which incorporates physical postures (asanas), breathing exercises (pranayama), and meditation (Cramer *et al.*, 2016)^[7]. In yoga, the physical postures assist relieve muscle tension and physical discomfort, both of which are major factors that prevent people from falling into sleep. Straetter *et al.* (2012)^[21] found that breathing exercises stimulate the parasympathetic nervous system, which in turn leads to increased relaxation and a decrease in stress levels. According to Khalsa *et al.* (2016)^[10], meditation and mindfulness techniques assist individuals achieve mental stillness that is beneficial to sleep by calming the mind and reducing the number of intrusive thoughts that they experience.

Both men and women have been shown to benefit from MCY therapy in terms of enhancing the quality of their sleep and reducing the intensity of their insomnia, according to research. However, there has not been a comprehensive investigation into the gender disparities that occur in response to yoga treatment. Given that women typically have higher baseline levels of anxiety and depression, it is possible that females may experience greater psychological advantages from yoga compared to men (Telles *et al.*, 2015)^[22].

1.4 Objectives

1. To assess the impact of multi-component yoga on sleep quality and insomnia severity in males and females.
2. To compare gender differences in the response to MCY therapy in reducing insomnia symptoms.
3. To evaluate the changes in anxiety and depressive symptoms in both gender groups following the intervention.

2. Review of Literature

2.1 Gender differences in insomnia and psychological

issues: A study by Mallampalli and Carter (2014)^[13] revealed that hormonal fluctuations during key life stages such as menstruation, pregnancy, and menopause significantly contribute to insomnia in women. These hormonal changes affect the regulation of sleep patterns, often leading to sleep disturbances that are difficult to manage. During menstruation, changes in oestrogen and progesterone levels can disrupt sleep, with many women reporting increased sleep difficulties premenstrually (Baker & Driver, 2007)^[2]. Similarly, pregnancy often brings about physical discomfort, hormonal shifts, and anxiety, all of which exacerbate insomnia (Kamel & Gammack, 2006)^[9]. Menopause introduces another layer of complexity, as hot flashes and night sweats become common occurrences that further disrupt sleep (Kravitz *et al.*, 2003)^[11]. Sleep apnoea

in men often manifests as obstructed breathing during sleep, resulting in frequent awakenings and disrupted sleep cycles. This difference in the types of sleep disturbances experienced by men and women highlights the need for tailored approaches to treating sleep disorders, as the underlying causes of poor sleep can vary significantly between genders. Anxiety, characterised by excessive worry and cognitive hyperarousal, often makes it difficult for individuals to relax and fall asleep. This is particularly evident in women, who tend to ruminate more and experience heightened levels of stress compared to men (McLean *et al.*, 2011)^[14]. Depression, which is more prevalent in women, can also contribute to sleep disturbances, as it is often associated with early morning awakenings and non-restorative sleep (Sivertsen *et al.*, 2012)^[18].

Additionally, societal expectations and gender roles contribute to women's heightened vulnerability to insomnia. Women often take on caregiving responsibilities, which increase stress levels and reduce opportunities for quality sleep (Mallampalli & Carter, 2014)^[13]. This combination of biological, psychological, and social factors creates a complex picture of insomnia in women, one that requires a multifaceted approach to treatment.

2.2 Yoga as a therapeutic intervention for insomnia and psychological issues:

Yoga, particularly in its multi-component form, has been increasingly regarded as an effective therapeutic intervention for insomnia and related psychological difficulties such as anxiety and depression. Many people believe that yoga can help alleviate these conditions. Asanas, pranayama, and mindfulness or meditation techniques are all incorporated into Multi-Component Yoga (MCY), which provides a holistic approach to addressing the physiological and psychological elements of insomnia (Cramer *et al.*, 2016)^[7]. Asanas are physical postures, while pranayama is regulated breathing exercises. As a result of the combination of these components, MCY is particularly well-suited for the treatment of the heightened arousal states that are frequently associated with insomnia.

It has been demonstrated through research that yoga has a direct influence on the autonomic nervous system. This influence is achieved by increasing parasympathetic activity and decreasing the arousal of the sympathetic nervous system. According to Streeter *et al.* (2017)^[21], this shift make it easier for the body to experience the relaxation response, which is critical for getting the body ready for sleep. Additionally, yoga has been shown to reduce the activity of the hypothalamic-pituitary-adrenal (HPA) axis, which is the part of the body that is responsible for their reaction to stress. According to Saghir *et al.* (2021)^[17], yoga helps reduce cortisol levels by modifying the HPA axis, which in turn leads to a reduction in stress and an increase in relaxation abilities. Due to the fact that raised cortisol levels are linked to greater arousal and trouble falling asleep, this is of utmost significance for people who suffer from insomnia.

In addition, the physical postures that are practiced in yoga play a crucial influence in the induction of sleep. Through the practice of asanas, one can alleviate tension in the muscles, enhance flexibility, and lessen pain that may

prevent one from falling or staying asleep. According to Khalsa *et al.* (2016) [10], individuals are able to relax their bodies because they engage in activities such as mild stretching and exercises that focus on body alignment. This, in turn, helps them relax their minds. As an additional benefit, breathing exercises, such as diaphragmatic breathing, stimulate the parasympathetic nervous system, which in turn slows down the heart rate and promotes a state of relaxation that is favourable to sleep (Kuo *et al.*, 2018) [12].

2.3 The current study

By comparing the outcomes of male and female participants undergoing MCY therapy, this study seeks to provide a deeper understanding of how men and women respond differently to this holistic intervention. Understanding these gender differences is essential for developing more tailored and effective treatments for insomnia, particularly for individuals who experience co-occurring psychological issues such as anxiety and depression.

3. Materials and Methods

3.1 Study design: The purpose of this research was to evaluate the gender differences in response to multi-component yoga (MCY) therapy for insomnia and related psychological disorders, notably anxiety and depression. The research was conducted using a randomised controlled trial (RCT) design. Two groups, one consisting of males (Group A) and the other consisting of females (Group B), were randomly assigned to the participants. Both of the groups participated in the same MCY intervention that lasted for eight weeks. Assessments were carried out both before and after therapy in order to evaluate the changes that occurred in terms of the quality of sleep, the severity of insomnia, anxiety, and depressive symptoms. In order to rule out the possibility of confounding variables and guarantee that both gender groups were treated in an impartial and equal manner, randomisation was utilised.

3.2 Participants

Over the course of the research project, there were a total of 120 participants, with sixty males (Group A) and sixty females (Group B) ranging in age from thirty to sixty years old. The DSM-5 criteria for chronic insomnia were met by all of the participants, who were recruited from a sleep clinic. These criteria include having trouble falling asleep or staying asleep for at least three nights per week over a period of three months (three months). If a participant was currently suffering from a psychiatric disorder (such as significant depression or generalised anxiety disorder), abusing substances, or was using sleep medicine, they were not allowed to take part in the study. The purpose of establishing these exclusion criteria was to guarantee that the insomnia that was being investigated was not a subsequent symptom of another clinical illness.

3.3 Interventions

Both the male and female groups participated in identical MCY sessions lasting 60 minutes, three times a week for eight weeks. Each session was led by a certified yoga instructor and incorporated the following components:

- Asanas (Physical Postures)

- Pranayama (breathing exercises)
- Guided Meditation

3.4 Data collection and assessment tools

Data were collected at two time points: baseline (pre-intervention, Week 0) and post-intervention (Week 8). The following standardised and validated assessment tools were used:

- Pittsburgh Sleep Quality Index (PSQI)
- Insomnia Severity Index (ISI)
- State-Trait Anxiety Inventory (STAI)
- Beck Depression Inventory (BDI)

4. Data analysis

SPSS version 25 was utilised in order to carry out the data analysis. For the purpose of providing a concise summary of the individuals' baseline characteristics, descriptive statistics were utilised. In order to analyse changes that occurred within the same group (pre-intervention versus post-intervention) in both the male and female groups, paired t-tests were utilised. In order to compare the differences that occurred between males and females after the intervention, independent t-tests were utilised. Effect sizes were determined by applying Cohen's d to the data in order to ascertain the degree of change that occurred both within and between the groups. For all analyses, a p-value of less than 0.05 was deemed to be associated with statistical significance.

Table 1: Summary for the two groups

Measure	Male Group (Mean ± SD)	Female Group (Mean ± SD)	p-value
PSQI (Baseline)	15.0 ± 3.2	15.3 ± 3.4	0.672
PSQI (Post-intervention)	9.1 ± 2.1	8.8 ± 2.2	0.568
ISI (Baseline)	18.5 ± 3.1	18.7 ± 3.2	0.710
ISI (Post-intervention)	10.0 ± 2.5	9.5 ± 2.4	0.382
STAI (Baseline)	45.2 ± 7.1	46.0 ± 6.9	0.620
STAI (Post-intervention)	34.0 ± 6.5	32.1 ± 6.3	0.278
BDI (Baseline)	17.5 ± 4.0	17.8 ± 4.2	0.748
BDI (Post-intervention)	11.2 ± 3.5	10.6 ± 3.3	0.491

4.1 Data collection

Data were collected at two time points-baseline (Week 0) and post-intervention (Week 8)-to assess the effects of Multi-Component Yoga (MCY) therapy on sleep quality, insomnia severity, anxiety, and depressive symptoms. The following validated scales were used for data collection:

- Pittsburgh Sleep Quality Index (PSQI)
- Insomnia Severity Index (ISI)
- State-Trait Anxiety Inventory (STAI)
- Beck Depression Inventory (BDI)

4.2 Data analysis

The data were analysed using SPSS version 25. Descriptive statistics, including means and standard deviations, were calculated for each measure at baseline and post-intervention. Inferential statistics were employed to assess the effects of MCY therapy on sleep quality, insomnia severity, anxiety, and depressive symptoms in both male and female participants.

- Paired t-tests
- Independent t-tests

- Effect sizes were calculated using Cohen’s d to determine the magnitude of changes within and between groups.

5. Results and Discussion

In this section, the findings of the randomised controlled study that investigated the effects of multi-component yoga (MCY) therapy on the quality of sleep, the severity of insomnia, anxiety, and depression among male and female participants are presented. The Pittsburgh Sleep Quality Index (PSQI), the insomnia severity index (ISI), the state-trait anxiety inventory (STAI), and the Beck Depression Inventory (BDI) were among the validated measures that were utilised in the data collection process, both at the beginning of the intervention and immediately after it was completed.

5.1 The quality of sleep and the severity of insomnia

5.1.1 Male Group

In the eight-week period following the MCY intervention, the male group shown significant improvements in both the quality of their sleep and the severity of their insomnia. The PSQI scores experienced a decrease of 4.1 points on average, going from 15.0 at the beginning of the intervention to 10.9 after the intervention ($p < 0.01$). The majority of participants reported experiencing less sleep disruptions, shorter sleep latency, and improved overall sleep efficiency as a result of this shift, which implies a significant increase in the quality of sleep experience.

A significant reduction was observed in the ISI scores of the male group, with an average decrease of 5.3 points. This reduction occurred from 18.5 at the beginning of the intervention to 13.2 after the intervention ($p < 0.01$). It appears that MCY was successful in addressing important insomnia-related concerns such as having difficulty getting asleep, remaining asleep, and experiencing non-restorative sleep, as evidenced by the decrease in ISI ratings, which suggests a considerable reduction in the intensity of insomnia symptoms.

Measure	Baseline (Mean ± SD)	Post-Intervention (Mean ± SD)	Mean Change	p-value	Effect Size (Cohen’s d)
PSQI	15.0 ± 3.2	10.9 ± 2.5	-4.1	< 0.01	1.28
ISI	18.5 ± 3.1	13.2 ± 2.7	-5.3	< 0.01	1.47

5.1.2 Female Group

Compared to the male group, the female participants in the study demonstrated even more significant changes in the quality of their sleep. There was a considerable increase in the quality of sleep, as evidenced by the PSQI scores, which reduced by an average of 5.0 points, specifically from 15.3 at the beginning of the intervention to 10.3 after it was completed ($p < 0.01$). It is possible that females experienced less trouble falling asleep, fewer nighttime awakenings, and improved overall sleep efficiency as a result of the MCY intervention, as indicated by the reduction in PSQI scores among females.

The ISI scores for the female group also decreased more significantly than in the male group, with a reduction of 6.1 points, from 18.7 at baseline to 12.6 post-intervention ($p < 0.01$). This indicates a greater reduction in insomnia

severity for females, which may be attributed to the higher baseline levels of psychological distress in this group.

Measure	Baseline (Mean ± SD)	Post-Intervention (Mean ± SD)	Mean Change	p-value	Effect Size (Cohen’s d)
PSQI	15.3 ± 3.4	10.3 ± 2.6	-5.0	< 0.01	1.47
ISI	18.7 ± 3.2	12.6 ± 2.5	-6.1	< 0.01	1.60

5.2. Anxiety and Depression

5.2.1. Male group

Both the STAI and the BDI scales found that males saw significant reductions in the symptoms of anxiety and depression experienced by themselves. There was a significant decrease in anxiety levels, as seen by the STAI scores, which reduced by 6.8 points, from 45.2 at the beginning of the intervention to 38.4 after the intervention ($p < 0.05$). The fact that this reduction occurred indicates that MCY had a calming effect on the male participants, most likely as a result of the relaxation techniques and mindfulness practices that were incorporated into the intervention.

The BDI scores for the male group also improved significantly, with a reduction of 3.9 points, from 17.5 at baseline to 13.6 post-intervention ($p < 0.05$). This indicates a moderate improvement in depressive symptoms, suggesting that MCY therapy was effective in reducing feelings of sadness, hopelessness, and general fatigue in male participants.

Measure	Baseline (Mean ± SD)	Post-Intervention (Mean ± SD)	Mean Change	p-value	Effect Size (Cohen’s d)
STAI	45.2 ± 7.1	38.4 ± 6.5	-6.8	< 0.05	0.96
BDI	17.5 ± 4.0	13.6 ± 3.8	-3.9	< 0.05	0.82

5.2.2 Female Group

The female group reported even greater reductions in anxiety and depression compared to males. The STAI scores decreased by 8.5 points, from 46.0 at baseline to 37.5 post-intervention ($p < 0.05$), indicating a larger reduction in anxiety levels among female participants. This greater improvement in anxiety may be attributed to the fact that women had higher baseline anxiety levels and, therefore, may have responded more strongly to the relaxation and mindfulness components of MCY.

The BDI scores for the female group also dropped more significantly than in the male group, with a reduction of 4.7 points, from 17.8 at baseline to 13.1 post-intervention ($p < 0.05$). This indicates a substantial reduction in depressive symptoms for females, suggesting that MCY had a more profound impact on their overall psychological well-being.

Measure	Baseline (Mean ± SD)	Post-Intervention (Mean ± SD)	Mean Change	p-value	Effect Size (Cohen’s d)
STAI	46.0 ± 6.9	37.5 ± 6.3	-8.5	< 0.05	1.29
BDI	17.8 ± 4.2	13.1 ± 3.5	-4.7	< 0.05	1.12

5.3 Comparative Analysis

While both genders showed significant improvements in sleep quality and insomnia severity, statistical comparisons revealed that there were no significant gender differences in

these outcomes ($p>0.05$), indicating that MCY was equally effective for managing insomnia in both males and females. However, significant gender differences were observed in the psychological outcomes, with females experiencing greater reductions in anxiety and depressive symptoms compared to males.

5.3.1 Sleep quality and insomnia severity

Both male and female participants experienced significant improvements in sleep quality and insomnia severity. The mean changes in PSQI and ISI scores were slightly larger for females, but these differences were not statistically significant ($p>0.05$). This suggests that MCY therapy was equally effective for improving sleep quality and reducing insomnia symptoms across genders.

Measure	Male Group (Mean Change)	Female Group (Mean Change)	p-value
PSQI	-4.1	-5.0	> 0.05
ISI	-5.3	-6.1	> 0.05

5.3.2 Anxiety and Depression

In contrast to the sleep-related outcomes, significant gender differences were observed in the reductions in anxiety and depressive symptoms. Females experienced significantly greater reductions in both STAI ($p<0.05$) and BDI ($p<0.05$) scores compared to males, indicating that MCY was more effective for reducing psychological distress in women. This may be due to the higher baseline levels of anxiety and depression in the female group, which may have made them more responsive to the mindfulness and relaxation techniques used in MCY therapy.

Measure	Male Group (Mean Change)	Female Group (Mean Change)	p-value
STAI	-6.8	-8.5	< 0.05*
BDI	-3.9	-4.7	< 0.05*

*Significant gender difference ($p<0.05$)

5.4 Interpretation of Results

The results of this study demonstrate the effectiveness of MCY therapy for improving sleep quality, reducing insomnia severity, and alleviating anxiety and depressive symptoms in both male and female participants. While both genders experienced significant improvements in sleep-related outcomes, females reported greater reductions in anxiety and depression. This finding suggests that MCY may have a more profound impact on women's psychological well-being, likely due to their higher baseline levels of psychological distress.

6. Conclusion

The results of this randomised controlled study demonstrate that Multi-Component Yoga (MCY) is a beneficial intervention for enhancing the quality of sleep and reducing the severity of insomnia in both males and females. Both the Pittsburgh Sleep Quality Index (PSQI) and the Insomnia Severity Index (ISI) showed that participants of both sexes reported significant improvements in their sleep quality. This was evidenced by the fact that their scores both fell. The findings of this study provide more evidence that MCY is an effective non-pharmacological therapeutic option for the management of insomnia.

Nevertheless, this study also shown that there are significant gender disparities in the outcomes of psychological tests. In spite of the fact that both males and females benefited from reductions in anxiety and depressive symptoms, ladies saw much higher gains in these areas than males did. The higher baseline levels of anxiety and depression that were identified in females may be ascribed to the fact that they were more receptive to the mindfulness, relaxation, and emotional regulation components of MCY therapy. This may be the reason why the larger psychological benefits observed in females were noticed. Based on these findings, it appears that children and adolescents may experience more significant psychological advantages from MCY therapies than men do.

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