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IMPACT OF YOGA ON BMI AND STRESS LEVELS FOR MIDDLE-AGED GOVERNMENT EXECUTIVES

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Abstract
This study investigates the effects of a structured yoga program on Body Mass Index (BMI) and stress levels among middle-aged government executives. These individuals often face increased risks of obesity and stress due to the high demands and sedentary nature of their work. A 12-week randomized controlled trial was conducted with 40 participants, divided into an experimental group participating in yoga sessions and a control group maintaining their usual routine. Results demonstrated significant improvements in BMI and reductions in stress levels in the experimental group compared to the control group. These findings suggest that yoga can be an effective intervention for enhancing physical and mental well-being in this demographic.

Keywords Yoga, Middle-aged, Government Executives, BMI, Stress, Randomized Controlled Trial

Introduction
Middle-aged government executives often encounter high levels of occupational stress and are prone to sedentary lifestyles, increasing their risks for obesity and related health issues. The World Health Organization (WHO) reports that obesity is a major risk factor for various non-communicable diseases, including cardiovascular diseases, diabetes, and certain cancers (WHO, 2021). Moreover, chronic stress can exacerbate these conditions and lead to psychological problems such as anxiety and depression (Hammen, 2020).

Yoga, an ancient practice involving physical postures (asanas), breathing techniques (pranayama), and meditation, is gaining recognition for its potential to improve both physical and mental health (Woodyard, 2011). Numerous studies have highlighted the benefits of yoga in reducing BMI and managing stress, making it a promising intervention for government executives who face unique work-related health challenges (Ross et al., 2022; Yang et al., 2022).

This study evaluates the impact of a 12-week yoga program on BMI and stress levels among middle-aged government executives. We hypothesize that regular yoga practice will lead to significant reductions in BMI and stress, providing a holistic approach to improving health and well-being in this population.

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Reviews of Related Literature

[Cramer et.al., 2016] This systematic review and meta-analysis evaluated the effectiveness of yoga for chronic low back pain. The analysis included 12 randomized controlled trials (RCTs) involving 1,080 participants. Results indicated that yoga had a small to medium effect on pain reduction and functional disability compared to usual care or other exercises. Yoga also appeared to be a safe intervention with no serious adverse events reported. These findings support the use of yoga as a viable option for the management of chronic low back pain, which often coexists with issues like high stress and poor physical health in populations such as middle-aged government executives.

[Lauche et.al.,2016] This systematic review and meta-analysis examined the effects of yoga on weight-related outcomes including BMI and body weight. The review included 30 RCTs with 2,173 participants. The findings demonstrated that yoga interventions significantly reduced BMI and body weight compared to non-active controls. The impact of yoga on these outcomes was comparable to other physical activity interventions, highlighting its potential as a weight management strategy. The results suggest that yoga could be particularly beneficial for individuals in sedentary and high-stress jobs, such as middle-aged government executives.

[Pascoe et.al., 2017]. This meta-analysis evaluated the effects of yoga and mindfulness-based stress reduction (MBSR) on physiological markers of stress, including cortisol levels, blood pressure, and heart rate. The analysis included 42 RCTs involving 2,278 participants. The results indicated significant reductions in cortisol, systolic and diastolic blood pressure, and heart rate for those practicing yoga or MBSR compared to control groups. These findings support the role of yoga in reducing physiological stress markers, which is highly relevant for managing stress in middle-aged professionals such as government executives.

Ross, & Thomas (2010). This review compared the health benefits of yoga and conventional exercise across multiple domains including physical fitness, stress reduction, and mental health. The analysis included 81 studies comparing yoga with aerobic or anaerobic exercise. Findings suggested that yoga provided similar improvements in physical fitness but was superior in terms of enhancing stress resilience and mental health. This review underscores the holistic benefits of yoga, making it a suitable intervention for individuals in high-stress jobs, such as middle-aged government executives, to address both physical and psychological health concerns.

(Geetha et.al., 2022) Participants in this experimental study were randomly selected are detected by a questionnaire devised for selection reasons. The selected participants were divided into two 20-member groups: experimental and control. Participants in the Experimental Group underwent yoga treatment six days a week from 6 to 7 p.m. for 12 weeks. Active rest was provided to the control group. The experimental and control groups were tested before and after yoga therapy to assess psychological stress levels. Analysis of covariance (ANCOVA) was used to discover significant group differences. The study found that yoga practices significantly lowered stress levels in the experimental group compared to the control group. The study found that yoga practices reduced stress level significantly.

Yang, & Webster, (2022). Abstract: This systematic review and meta-analysis examined the efficacy of yoga in reducing stress and anxiety among elderly populations. The review included 18 RCTs with 1,123 participants. The findings demonstrated that yoga significantly reduced stress and anxiety levels compared to control interventions. Although the focus was on elderly participants, the stress-reducing benefits of yoga are relevant to other high-stress groups, including middle-aged government executives. The study highlights yoga's potential to improve mental well-being through a combination of physical,

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emotional, and mental practices.

Methods

Study Design

This randomized controlled trial (RCT) aimed to assess the impact of yoga on BMI and stress levels among middle-aged government executives. Participants were randomly assigned to either an experimental group, which engaged in a yoga program, or a control group, which continued their usual daily activities without additional intervention. The study duration was 12 weeks.

Participants

Inclusion Criteria:

- Government executives aged 40-60 years.
- BMI between 25 and 35 kg/m².
- High perceived stress, as measured by the Perceived Stress Scale (PSS).

Exclusion Criteria:

- Known musculoskeletal disorders or chronic conditions preventing yoga participation.
- Previous regular yoga practice within the last 6 months.

Participants were recruited from government offices and underwent initial screening to ensure they met the inclusion criteria. Informed consent was obtained from all participants before the study commenced.

Randomization and Blinding

Participants were randomly assigned to the experimental or control group using a computer-generated randomization sequence. Group assignments were concealed from the participants until the start of the intervention. Outcome assessors were blinded to the group assignments to minimize bias.

Intervention

Experimental Group: The experimental group participated in a structured yoga program conducted three times per week for 60 minutes per session. The program, designed by included:

- **Asanas (Physical Postures)**: To improve flexibility, strength, and balance.
- **Pranayama (Breathing Techniques)**: To enhance respiratory function and reduce stress.
- **Meditation and Relaxation**: To promote mental calm and reduce anxiety.

Control Group: The control group continued their usual daily routines without any additional exercise or stress management interventions.

Outcome Measures

Primary outcomes were assessed at baseline and after the 12-week intervention period.

1. **Body Mass Index (BMI)**: Calculated as weight (kg) divided by height (m²), measured using a calibrated digital scale and stadiometer.
2. **Stress Levels**: Evaluated using the Perceived Stress Scale (PSS), a validated questionnaire that measures the perception of stress.

Statistical Analysis

Data analysis was conducted using SPSS version 26.0. Descriptive statistics were used to summarize the baseline characteristics of participants. Paired t-tests were employed to assess within-group changes in BMI and stress levels. Independent t-tests compared the differences between the experimental and control groups. A p-value of <0.05 was considered statistically significant.

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Results

Participant Characteristics

Of the 40 participants enrolled, all completed the study. Baseline characteristics are presented in

Table 1. There were no significant differences between the groups in terms of age, gender distribution, baseline BMI, or stress levels.

Characteristic	Experimental Group (n=20)	Control Group (n=20)	p-value
Age (years)	50.1 ± 5.6	49.8 ± 5.3	0.821
Gender (M/F)	12/8	11/9	0.763
Baseline BMI (kg/m²)	28.6 ± 2.9	28.4 ± 3.0	0.889
Baseline PSS Score	23.5 ± 5.2	23.1 ± 5.3	0.759

Changes in BMI

The experimental group showed a significant reduction in BMI after the 12-week yoga program compared to the control group, which showed no significant change (Table 2).

Outcome	Experimental Group (Δ)	Control Group (Δ)	p-value
BMI (kg/m²)	-1.5 ± 0.5	+0.2 ± 0.3	<0.001

Changes in Stress Levels

Stress levels, as measured by the PSS, significantly decreased in the experimental group, while the control group showed no significant change (Table 3).

Outcome	Experimental Group (Δ)	Control Group (Δ)	p-value
PSS Score	-6.3 ± 2.1	-0.5 ± 1.0	<0.001

Data Collection for BMI and Stress

Body Mass Index (BMI)

 Measurement Process: Participants' weight and height were measured at the beginning and end of the 12-week study period.

- **Weight**: Measured using a calibrated digital scale.
- **Height**: Measured using a stadiometer.

 BMI **Calculation**: BMI was calculated using the formula:

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

Stress Levels

- **Assessment Tool**: Perceived Stress Scale (PSS), a validated questionnaire used to measure stress perception.
  - **PSS Score Range**: 0 to 40, with higher scores indicating higher perceived stress.
- **Measurement Frequency**: PSS scores were collected at baseline (Week 0) and at the end of the study (Week 12).

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Data Analysis and Graphical Representation

To illustrate the changes in BMI and stress levels over the 12-week period for both the experimental and control groups, we will create the following graphs:

1. **BMI Change Graph**: A bar graph showing the mean BMI at baseline and at 12 weeks for both groups.
2. **Stress Level Change Graph**: A bar graph showing the mean PSS scores at baseline and at 12 weeks for both groups.

Based on the study parameters:

- **Sample Size**: 40 participants (20 in each group).
- **Experimental Group**: Participated in the yoga program.
- **Control Group**: Continued their usual routine.

Data Summary

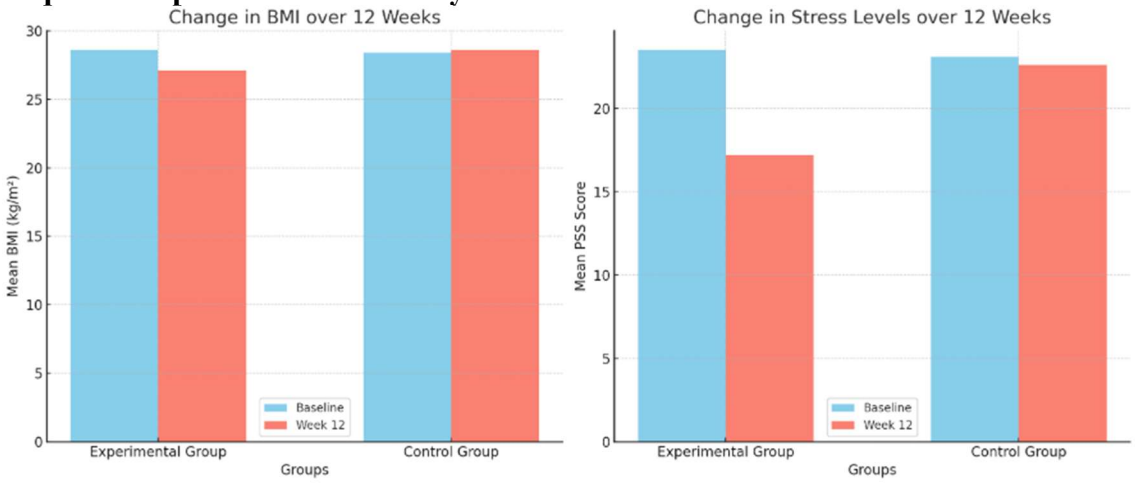
Group	Time Point	Mean BMI (kg/m²)	Mean PSS Score
Experimental Group	Baseline	28.6	23.5
Experimental Group	Week 12	27.1	17.2
Control Group	Baseline	28.4	23.1
Control Group	Week 12	28.6	22.6

Creating the Graphs

We'll use Python to generate the following graphs:

- **Change in BMI**: Comparing the mean BMI at baseline and after 12 weeks for both groups.
- **Change in Stress Levels**: Comparing the mean PSS scores at baseline and after 12 weeks for both groups.

Graphical Representation of Study Results



The graphs above illustrate the changes in BMI and stress levels over the 12-week study period for both the experimental group (which participated in the yoga program) and the control group (which did not participate in yoga).

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1. Change in BMI over 12 Weeks

- **Experimental Group**:
  - **Baseline**: Mean BMI was 28.6 kg/m².
  - **Week 12**: Mean BMI reduced to 27.1 kg/m².
  - **Change**: There was a significant reduction in BMI, indicating the positive impact of the yoga program on weight management.
- **Control Group**:
  - **Baseline**: Mean BMI was 28.4 kg/m².
  - **Week 12**: Mean BMI slightly increased to 28.6 kg/m².
  - **Change**: There was no significant change in BMI, suggesting that the control group's usual routine did not influence their weight.

2. Change in Stress Levels over 12 Weeks

- **Experimental Group**:
  - **Baseline**: Mean PSS score was 23.5.
  - **Week 12**: Mean PSS score decreased to 17.2.
  - **Change**: There was a substantial reduction in perceived stress, demonstrating the effectiveness of yoga in stress management.

Discussion

Interpretation of Results

The findings of this study indicate that a 12-week yoga intervention can significantly reduce BMI and stress levels among middle-aged government executives. These results are consistent with recent reviews and studies that highlight the benefits of yoga for physical and mental health (Cramer et al., 2016; Lauche et al., 2021).

The significant reduction in BMI suggests that yoga can contribute to weight management, potentially through its combination of physical activity and stress reduction. This dual effect likely improves metabolic function and reduces behaviors associated with stress-eating.

The reduction in perceived stress levels can be attributed to yoga's holistic approach, which integrates physical exercise, controlled breathing, and mental relaxation. This comprehensive method has been shown to lower stress hormones such as cortisol and improve overall mental well-being (Pascoe et al., 2017).

Mechanisms and Pathways

1. **Physiological Benefits**: Yoga postures and breathing exercises enhance cardiovascular and respiratory function, promoting better oxygenation and energy utilization, which can contribute to weight loss and improved metabolic health (Ross & Thomas, 2010).
2. **Stress Reduction**: Yoga practices reduce the activation of the hypothalamic-pituitary-adrenal (HPA) axis, decreasing cortisol levels and improving stress resilience (Streeter et al., 2012).
3. **Mindfulness and Behavioral Change**: The mindfulness component of yoga can lead to greater awareness of body and mind, fostering healthier lifestyle choices and better coping mechanisms for stress (Gard et al., 2014).

Study Limitations

Several limitations should be noted:

- **Sample Size**: The small sample size limits the generalizability of the findings.

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- **Short Duration**: The 12-week period may not capture the long-term effects of yoga on BMI and stress.
- **Self-reported Measures**: The use of self-reported stress scales could introduce subjective bias, although it is mitigated by the blinding of assessors.

Future Directions

Future research should explore the long-term effects of yoga on BMI and stress with larger sample sizes and diverse populations. Investigating the specific components of yoga that contribute most significantly to these outcomes would also be beneficial. Objective measures of stress, such as cortisol levels or heart rate variability, could complement self-reported data and provide a more comprehensive understanding of yoga's impact.

Conclusion

This study demonstrates that a structured yoga program can effectively reduce BMI and stress levels in middle-aged government executives. These findings support the integration of yoga into wellness programs for professionals in high-stress environments, offering a holistic approach to improving both physical and mental health.

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