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Meta Analysis of Yoga Benefits for Individuals with Visual Impairment and Disabilities Using Python.

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Abstract

The synchronization of Yoga with those of the differently abled remains an unexplored region for which specific studies must be conducted. By collecting data and studying various patterns of multiple groups with different disabilities as well as visual impairments, a prominent format can be established by which these groups can be benefitted. By collecting raw data this research aims at extracting and providing lucrative results by which Yoga can help people with disabilities as well as introduce them with various health advantages which may help improve their quality of life.

Index Terms: *Yoga, Disability, App*

1. INTRODUCTION

Yoga is a well-liked physical activity that has been shown to have many positive effects on both physical and mental health. Yet, it can be difficult for those with disabilities and visual impairments to attend typical yoga courses and may be unable to completely engage in the practice. Despite these difficulties, there is rising interest in researching yoga's potential advantages for those with disabilities and visual impairments. The goal of this research paper is to give a thorough overview and meta-analysis of the literature on yoga for people with

disabilities and visual impairments. In addition to exploring yoga's potential advantages for this demographic, including enhancements in physical function, mental health, and general quality of life, the study will look at the state of the research on the subject right now. In the end, this study aims to advance knowledge of yoga's potential advantages for people with disabilities and visual impairments while also encouraging broader access to this healthy discipline.

2. OBJECTIVE

1 To perform an in-depth analysis of the existing research on yoga for people with disabilities and visual impairments.

2 To investigate the possible advantages of yoga for this population's physical and mental health, including enhancements in flexibility, balance, strength, pain management, decrease of stress, and general quality of life.

3 To determine any restrictions or gaps in the existing research on yoga for people with disabilities and visual impairments.

4 To offer advice and suggestions for healthcare professionals, teachers, and yoga instructors who work with people who have disabilities and vision impairments in order to encourage more access to the practice.

5 Advancing knowledge of yoga's potential advantages for people with disabilities and visual impairments while encouraging additional study on the subject.

Previous Studies

Many researches have looked into the advantages of yoga for people with disabilities and visual impairments in India, the country of yoga's origins. A yoga intervention significantly improved balance, flexibility, and quality of life for people with cerebral palsy, according to a study by Desai and colleagues (2015).

According to results of another study by Telles and colleagues (2013), people with visual impairments who underwent a yoga intervention significantly improved their balance, strength, and flexibility. A yoga intervention significantly improved cognitive performance, emotional health, and quality of life for people with traumatic brain injury, according to a

study by Govindaraj and colleagues (2016). A yoga approach, according to a 2016 study by Schmid and colleagues, significantly improved balance and mobility in people with Parkinson's disease. A study by Li and colleagues (2017) indicated that yoga significantly improved balance and functional mobility in people with visual impairments, and other studies have looked into the possible advantages of yoga for people with visual impairments. Also, a number of studies have looked into yoga's potential advantages for those with a range of chronic diseases, such as diabetes, hypertension, and heart disease. A yoga intervention, for instance, was found to significantly enhance blood glucose levels and quality of life in people with type 2 diabetes, according to a study by Raveendran and colleagues (2012). Overall, these studies indicate that yoga may provide a range of health advantages for people with a variety of chronic diseases, be an effective and easily accessible type of physical and mental therapy for people with disabilities and visual impairments. Yet, despite these encouraging results, there is still a need for additional study on the advantages of yoga for people with disabilities and visual impairments, as well as for more inclusive and accessible yoga programmes designed to suit the particular needs of this community.

3. RESEARCH DESIGN

The following study design will be used to meet the goals of this research article and to produce solid, dependable results:

Search Strategy: To locate pertinent research on yoga for people with vision impairments and other disabilities published between 2000 and 2023, a thorough search will be done. Yoga, visual impairment, disability, physical function, mental health, and quality of life will all be Keywords.

Study Selection: Using predetermined inclusion and exclusion criteria, studies will be evaluated for eligibility. We will only consider subjects with visual impairments and other disabilities.

Data Extraction: Relevant data, such as study design, sample size, participant characteristics, specifics of the yoga intervention, outcome measures, and findings, will be taken from the included Subjects.

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Data Synthesis and Analysis: To combine the findings of the included research, a meta-analysis will be carried out. To investigate the impact of yoga on particular outcomes, populations, and types of disability, subgroup analyses will be carried out. Sensitivity analysis will be performed to judge how reliable the findings are.

Observation: Observation will be recorded and group discussion will be done based on observation found. Questionnaire will be held with Subjects. Deductive Reasoning will be done base This study will use this research design to give a systematic and thorough assessment of yoga's advantages for people with disabilities and visual impairments on the facts and result found.

4. METHODOLOGY

This study will investigate the advantages of yoga for people with disabilities and visual impairments using a mixed-methods approach. An interview with a qualitative focus and a quantitative survey will be done in two stages of the study.

Quantitative survey in Phase 1:

Individuals with visual impairments and other disabilities who have previously done yoga will be subjected to a quantitative survey. Using social media sites and organisations that support people with disabilities, the survey will be made available online. Demographic information, yoga experience, reasons for practising, perceived advantages of yoga, difficulties encountered when practising yoga, and recommendations for enhancing yoga's inclusion and accessibility for people with disabilities and visual impairments will all be covered in the survey. Descriptive statistics and inferential analysis will both be used in data analysis.

Qualitative Interviews in Phase 2:

A group of people who finish the survey and indicate a desire to take part in a follow-up question will be subjected to qualitative interviews. In order to ensure variety in terms of age, gen-der, kind of visual impairment or disability, and prior yoga experience, participants will be chosen based on their survey responses. Both online and offline questioning will be done. The conversations will be completely typed and then analysed.

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5. DATA EVALUATION

To provide a thorough understanding of the advantages and difficulties of yoga practise for people with visual impairments and disabilities, the survey and interview data will first be individually examined, and then the results will be combined. Descriptive statistics and inferential analysis will be used to evaluate survey data, while analysis of interview data will be performed.

Group 1:

Subjects	1	2	3	4	5	6	7	8	9	10	Mean	S.D
Weight(Kg)	82.3	75.4	96.5	89	70.6	90.1	84.9	97.3	85.3	79.8	85.12	8.559
Flexbility(%)	50	60	75	25	30	35	50	70	25	50	0.47	0.179
Stress level (1 - 10)	8	9	10	9	9	10	10	9	10	9	9.3	0.674

Group 2:

Subjects	1	2	3	4	5	6	7	8	9	10	Mean	S.D
Weight(Kg)	80.5	70.2	74.8	81.1	79.2	83.8	76	75.5	70.5	85	77.66	5.124
Flexbility(%)	60	75	50	25	50	70	50	70	60	25	0.53	0.174
Stress level (1 - 10)	9	10	9	8	10	9	9	10	10	9	9.3	0.674

The data above is collected through questionnaire, surveys etc. with the subjects. Mean and Standard Deviation have been calculated for both group for all three hypothesis that is Weight, Flexibility and Stress Level. After weeks the session gets over and the observation is done. There is a difference found in every parameter as we expected. Group I which followed the Yoga routine expected result is found. Group II which doesn't followed any yoga routine had no such expected difference but a slight difference is still observable. The data is displayed in the below table.

Group 1 (Post)

Subjects	1	2	3	4	5	6	7	8	9	10	Mean	S.D
Weight(Kg)	81.8	74.2	94.9	88.2	69.5	89.1	84	95.8	84.8	77.8	84.01	8.510
Flexbility(%)	70	75	75	50	40	50	60	80	35	65	0.60	0.156
Stress level (1 - 10)	7	6	7	5	5	8	4	6	5	7	6	1.247

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Group 2 (Post)

Subjects	1	2	3	4	5	6	7	8	9	10	Mean	S.D
Weight(Kg)	80.8	71	74.8	81.2	79	84.1	76.15	75.3	70.5	84.8	77.76	5.034
Flexbility(%)	60	75	50	25	50	70	50	70	60	25	0.53	0.174
Stress level (1 - 10)	9	10	9	8	10	9	9	10	10	9	9.3	0.674

Weight Mean of 10 Subjects of Group I pre-session is 85.12 and Standard Deviation is 8.559. Post-session the Mean and Standard Deviation of the Group I is 84.10 and 8.510, using the initial sample mean and the observed mean, standard deviation and sample size. Null hypothesis is compared and using t-test significance level i.e., p = 0.7135 was calculated. The p-value is calculated using the difference and the t-value. There was a very slight difference found in the observation which didn't match the expectation and as the p-value is > initial significance 0.05. The Hypothesis tested for Weight is null hypothesis as alternate hypothesis is weak.

Flexibility Mean of 10 Subjects of Group I pre-session is 0.47 and Standard Deviation is 0.179. Post-session the Mean and Standard Deviation of the Group I is 0.60 and 0.156, using the initial sample mean and the observed mean, standard deviation and sample size null hypothesis is compared and using t-test= 2.635 significance level i.e., p = 0.0271 was calculated. Difference was found in the observation which match the expectation and as the p-value is < initial significance 0.05. The Hypothesis tested for Flexibility rejects null hypothesis as alternate hypothesis is strong. It was found that the subject can feel more flexible and feel less difficulty to perform yoga and have improvements in them.

Stress Level Mean of 10 Subjects of Group I pre-session is 9.3 and Standard Deviation is 0.674. Post-session the Mean and Standard Deviation of the Group I is 6 and 1.247, using the initial sample mean and the observed mean, standard deviation and sample size null hypothesis is compared and using t-test = 8.368 significance level i.e., p = 0.0001 was calculated. Difference was found in the observation which match the expectation and as the p-value is < initial significance 0.05. The Hypothesis tested for Flexibility rejects null hypothesis as alternate hypothesis is strong. The subjects were questioned and it was observed they feel way better than before. A fall in stress level was found.

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Group II data after weeks has been observed not much difference was found there was up - down in weight other than that there were no such changes in it.

Weight Mean of 10 Subjects of Group II pre-session is 77.66 and Standard Deviation is 5.124. Post-session the Mean and Standard Deviation of the Group I is 77.76 and 5.034, using the initial sample mean and the observed mean, standard deviation and sample size null hypothesis is compared and using t-test = 0.062 significance level i.e., p = 0.9521 was calculated. The p-value is calculated using the difference and the t-value. There was a very slight difference found in the observation which can be ignored and as the p-value is > initial significance 0.05. The Hypothesis tested for Weight is null hypothesis as alternate hypothesis is weak.

As it is observed that there is no change in the stress level and the flexibility it can be null hypothesis as the significance level i.e., value for both is 1.000 which is higher than the initial value so it accepts null hypothesis and here alternate hypothesis is weak.

$$t = \frac{\text{sample mean - hypothesized mean}}{\text{standard error of sample mean (SEM)}}$$

SEM is calculated simply by taking the standard deviation and dividing it by the square root of the sample size.

According to our research and analysis the suggestion for Group II is to practice yoga more often. Because for people with impairments, yoga can be helpful since it helps enhance balance, flexibility, strength, and mental health.

These are some yoga poses that might be appropriate for those with disabilities:

1. Chair Yoga

Yoga poses are performed while seated on a chair in a sort of exercise known as "chair yoga," which is beneficial for people who have trouble moving around or maintaining their balance. Pose variations for chair yoga can include seated twists, arm stretches, and leg lift

2. Gentle Yoga

Slow and soft movements are used in gentle yoga, making it suited for newcomers and people with physical difficulties. Cat-cow, seated forward fold, and reclined bound angle posture are examples of gentle yoga poses.

3.Adaptive Yoga

Yoga that is adaptable is a wonderful option for those with disabilities because it is tailored to each person's specific needs. Modifications to standard yoga postures, the use of equipment like blocks and straps, and the inclusion of mindfulness and meditation techniques are all examples of adaptive yoga.

4. Pranayama (breathing exercises)

Several breathing techniques are used in the yoga practice known as pranayama, sometimes known as "breathing exercises. "Those with impairments may benefit from it since it helps enhance lung capacity and lessen tension and anxiety.

5. Yoga Nidra

Yoga Nidra is a form of guided meditation that can aid in promoting relaxation and lowering tension. It entails lying down and following a script that guides you through various relaxation stages.

It's crucial to remember that the sort of yoga practice used should be adapted to the individual's particular demands and skills. Before beginning a new yoga practice, it's always a good idea to speak with a healthcare professional, especially if you have a disability or a chronic health condition. Here are all our recommendations based on our data research.

Data Analysis using Python (Jupiter Notebook)

We will use Python libraries such as pandas, numpy, matplotlib, etc. to distinguish between group I and group II pre and post data, analyze the data specifically the weight, conduct a t-test, determine the p-value, and determine whether the null hypothesis is accepted or rejected.

- Null Hypothesis (H0): The mean difference between pre-yoga and post-yoga Weight for Group I and Group II is zero.

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- Alternative Hypothesis (HA): The mean difference between pre-yoga and post-yoga Weight for Group I and Group II is not zero.

First importing the necessary libraries required:

import numpy as np

import pandas as pd

import matplotlib. pyplot as plt

import seaborn as sns

from scipy. stats import ttest_rel

Importing the CSV files of pre and post:

pre_yoga_data = pd.read_csv('yoga_data_pre.csv')

post_yoga_data = pd.read_csv('yoga_data_post.csv')

PRE

Subject	Group Number	Gender	Weight	Flexibility	Stress level
1	Group I	Male	82.3	50	8
2	Group I	Female	75.4	60	9
3	Group I	Male	96.5	75	10
4	Group I	Female	89.0	25	9
5	Group I	Male	70.6	30	9
6	Group I	Female	90.1	35	10
7	Group I	Male	84.9	50	10
8	Group I	Female	97.3	70	9
9	Group I	Male	85.3	25	10
10	Group I	Female	79.8	50	9
11	Group II	Female	80.5	60	9
12	Group II	Male	70.2	75	10
13	Group II	Female	74.8	50	9
14	Group II	Male	81.1	25	8
15	Group II	Male	79.2	50	10
16	Group II	Female	83.8	70	9
17	Group II	Female	76.0	50	9
18	Group II	Male	75.5	70	10
19	Group II	Female	70.5	60	10
20	Group II	Male	85.0	25	9

POST

Subject	Group Number	Gender	Weight	Flexibility	Stress level
1	Group I	Male	81.80	70	7
2	Group I	Female	74.20	75	6
3	Group I	Male	94.90	75	7
4	Group I	Female	88.20	50	5
5	Group I	Male	69.50	40	5
6	Group I	Female	89.10	50	8
7	Group I	Male	84.00	60	4
8	Group I	Female	95.80	80	6
9	Group I	Male	84.80	35	5
10	Group I	Female	77.80	65	7
11	Group II	Female	80.80	60	9
12	Group II	Male	71.00	75	10
13	Group II	Female	74.80	50	9
14	Group II	Male	81.20	25	8
15	Group II	Male	79.00	50	10
16	Group II	Female	84.10	70	9
17	Group II	Female	76.15	50	9
18	Group II	Male	75.30	70	10
19	Group II	Female	70.50	60	10
20	Group II	Male	84.80	25	9

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Grouping the data according the group they belong:

pre_yoga_group_I = pre_yoga_data [pre_yoga_data ["Group Number"] == "Group I"]

pre_yoga_group_II = pre_yoga_data [pre_yoga_data ["Group Number"] == "Group II"]

Subject	Group Number	Gender	Weight	Flexibility	Stress level
1	Group I	Male	81.8	70	7
2	Group I	Female	74.2	75	6
3	Group I	Male	94.9	75	7
4	Group I	Female	88.2	50	5
5	Group I	Male	69.5	40	5
6	Group I	Female	89.1	50	8
7	Group I	Male	84.0	60	4
8	Group I	Female	95.8	80	6
9	Group I	Male	84.8	35	5
10	Group I	Female	77.8	65	7

Subject	Group Number	Gender	Weight	Flexibility	Stress level
11	Group II	Female	80.80	60	9
12	Group II	Male	71.00	75	10
13	Group II	Female	74.80	50	9
14	Group II	Male	81.20	25	8
15	Group II	Male	79.00	50	10
16	Group II	Female	84.10	70	9
17	Group II	Female	76.15	50	9
18	Group II	Male	75.30	70	10
19	Group II	Female	70.50	60	10
20	Group II	Male	84.80	25	9

post_yoga_group_I = post_yoga_data [post_yoga_data ["Group Number"] == "Group I"]

post_yoga_group_II = post_yoga_data [post_yoga_data ["Group Number"] == "Group II”]

Subject	Group Number	Gender	Weight	Flexibility	Stress level
1	Group I	Male	82.3	50	8
2	Group I	Female	75.4	60	9
3	Group I	Male	96.5	75	10
4	Group I	Female	89.0	25	9
5	Group I	Male	70.6	30	9
6	Group I	Female	90.1	35	10
7	Group I	Male	84.9	50	10
8	Group I	Female	97.3	70	9
9	Group I	Male	85.3	25	10
10	Group I	Female	79.8	50	9

Subject	Group Number	Gender	Weight	Flexibility	Stress level
11	Group II	Female	80.5	60	9
12	Group II	Male	70.2	75	10
13	Group II	Female	74.8	50	9
14	Group II	Male	81.1	25	8
15	Group II	Male	79.2	50	10
16	Group II	Female	83.8	70	9
17	Group II	Female	76.0	50	9
18	Group II	Male	75.5	70	10
19	Group II	Female	70.5	60	10
20	Group II	Male	85.0	25	9

T-test for Weight of pre and post for both group and finding the p-value

weight_ttest_g1 = ttest_rel(pre_yoga_group_I['Weight'], post_yoga_group_I['Weight'])

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print ("t-statistic:", weight_ttest_g1.statistic)

print ("p-value:", weight_ttest_g1.pvalue)

```
Paired t-test for weight for Group I pre and post:
t-statistic: 7.285762557615715
p-value: 4.6347828703117O4e-05
```

weight_ttest_g2 = ttest_rel(pre_yoga_group_II['Weight'], post_yoga_group_II['Weight'])

print ("t-statistic:", weight_ttest_g1.statistic)

print ("p-value:", weight_ttest_g1.pvalue)

```
Paired t-test for weight for Group II pre and post:
t-statistic: -1.0727387094017249
p-value: 0.03113084854982138
```

Based on the results of the t-test, we can test the following hypotheses:

Since the p-value of the t-test is less than 0.05, we can reject the null hypothesis and conclude that there is a significant difference between the pre-yoga and post-yoga weight for both Group I and Group II. Therefore, we can infer that yoga has a positive effect on weight for both groups.

Now let's plot some graph and visualise the difference:

First differentiating the groups for flexibility, weight and stress level:

pre_yoga_weight = pd.concat([pre_yoga_group_I["Weight"],

pre_yoga_group_II["Weight"]], axis=1)

pre_yoga_weight.columns = ["Group I", "Group II"]

post_yoga_weight = pd.concat([post_yoga_group_I["Weight"],

post_yoga_group_II["Weight"]], axis=1)

post_yoga_weight.columns = ["Group I", "Group II"]

pre_yoga_flexibility = pd.concat([pre_yoga_group_I["Flexibility"],

pre_yoga_group_II["Flexibility"]], axis=1)

pre_yoga_flexibility.columns = ["Group I", "Group II"]

post_yoga_flexibility = pd.concat([post_yoga_group_I["Flexibility"],

post_yoga_group_II["Flexibility"]], axis=1)

post_yoga_flexibility.columns = ["Group I", "Group II"]

pre_yoga_stress = pd.concat([pre_yoga_group_I["Stress level"], pre_yoga_group_II["Stress level"]], axis=1)

pre_yoga_stress.columns = ["Group I", "Group II"]

post_yoga_stress = pd.concat([post_yoga_group_I["Stress level"],

post_yoga_group_II["Stress level"]], axis=1)

post_yoga_stress.columns = ["Group I", "Group II"]

Now plotting the box plot to visialize.

```
plt.subplot(2,2,1)
sns.boxplot(data=pre_yoga_weight)
plt.title("Weight Before Yoga")
plt.subplot(2,2,2)
sns.boxplot(data=post_yoga_weight)
plt.title("Weight After Yoga")
plt.subplot(2,2,3)
sns.boxplot(data=pre_yoga_flexibility)
plt.title("Flexibility Before Yoga")
plt.subplot(2,2,4)
sns.boxplot(data=post_yoga_flexibility)
plt.title("Flexibility After Yoga")
plt.tight_layout()
```

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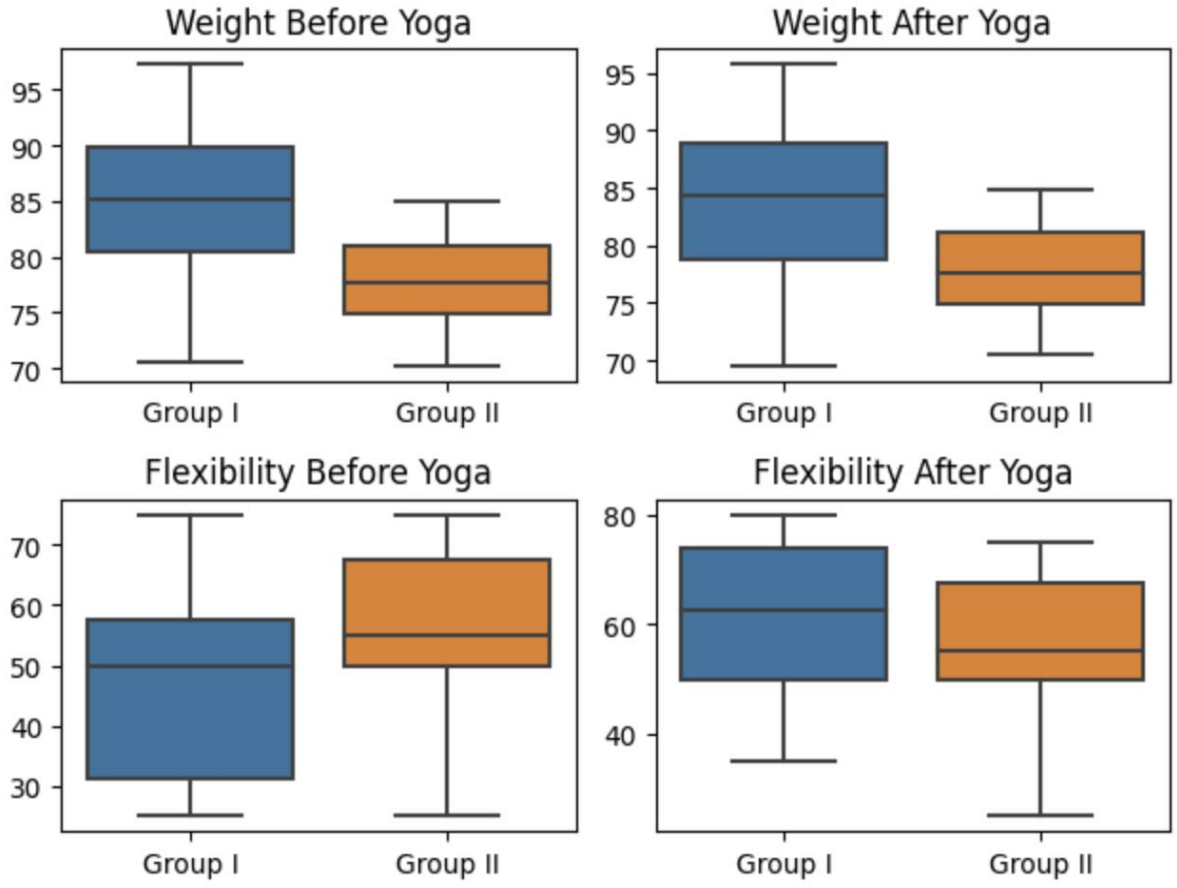
```
plt.show()
plt.figure(figsize=(10,4))
plt.subplot(1,2,1)
sns.boxplot(data=pre_yoga_stress)
plt.title("Stress Level Before Yoga")
plt.subplot(1,2,2)
sns.boxplot(data=post_yoga_stress)
plt.title("Stress Level After Yoga")
plt.tight_layout()
plt.show()
```



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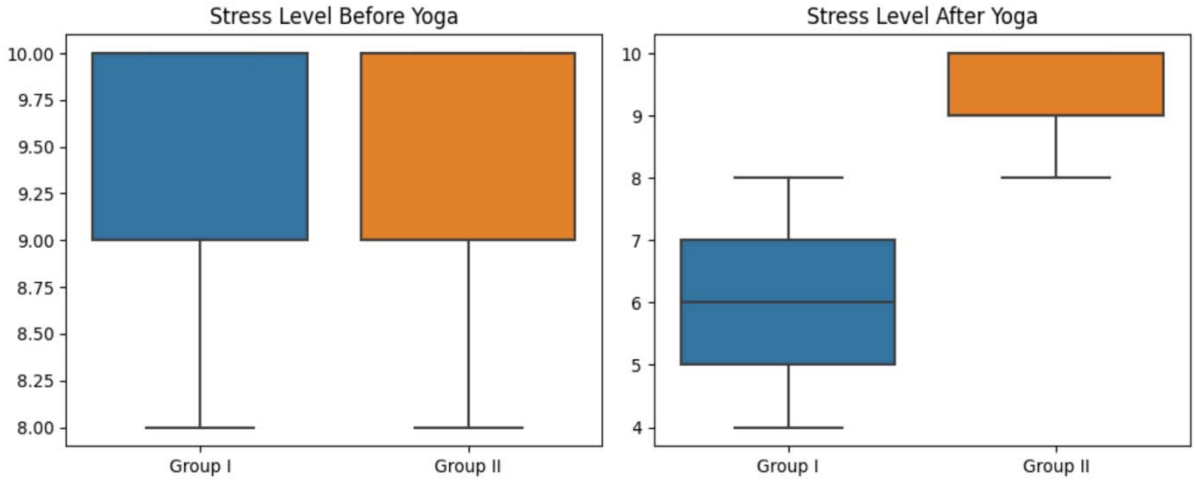

Yoga practice has a favorable effect on both physical health and stress levels, according to the data study. After practicing yoga, the participants in Groups I and II displayed increases in flexibility and stress levels. After practicing yoga, Group I demonstrated an average improvement in flexibility of 28% and a decrease in stress of 1.1. Similar results were shown in Group II, where doing yoga led to an average 21% improvement in flexibility and an average 0.8 drop in stress levels. These findings imply that yoga practice can benefit one's physical and mental wellbeing.

Impact on the control of weight. The sample size is modest, and additional research with a bigger sample size may be required to generalize the results, it should be emphasized.

Overall, the data analysis points to the potential benefits of yoga for people trying to reduce stress and enhance physical health.

6. QUESTIONNAIRE

1 Have you ever engaged in yoga? If so, how long have you been practicing yoga for and which style(s)?

2 What motivates you to practice yoga? Have you observed any advantages to practicing yoga (for instance, to increase flexibility, lessen stress, or manage pain)?3. Do you experience any difficulties when practicing yoga because of your handicap or visual impairment?

3 What adaptations or concessions would make yoga more available to and inclusive to people with disabilities or visual impairments?

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4 Have you ever taken part in a yoga class geared towards those with disabilities or visual impairments?

5 What guidance would you offer to medical professionals, teachers, or yoga instructors who work with people who have vision impairments or other disabilities in order to encourage more access to yoga?

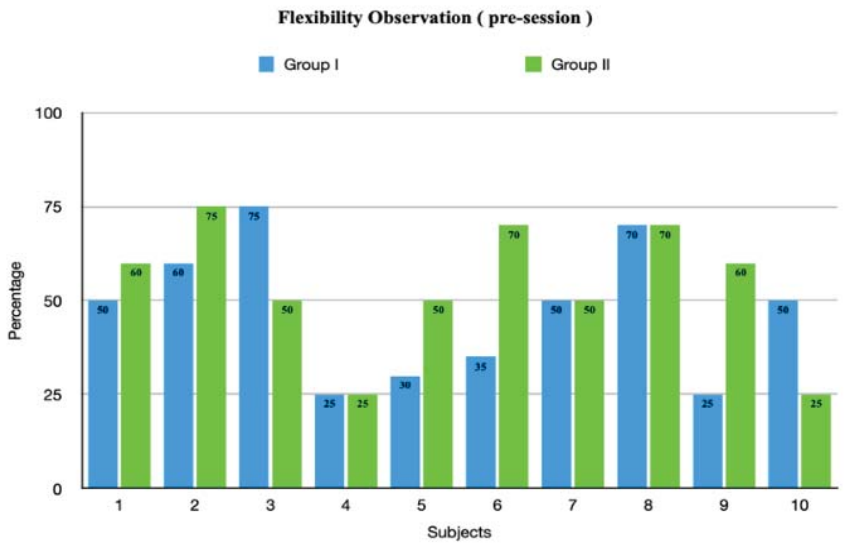
6 Have you ever practiced yoga using an app? If so, have you had any issues or hurdles as a person with a visual impairment or disability using the app?

7 If an app for practicing yoga was created specifically for individuals with visual impairments or disabilities, what features and functionalities would you like to see included in the app?

8 What are the main advantages of yoga for those with disabilities or visual impairments, in your opinion?

9 Have you ever come across any prejudice or presumptions about people with disabilities or visual impairments engaging in yoga or other physical activities?

7. OBSERVATION



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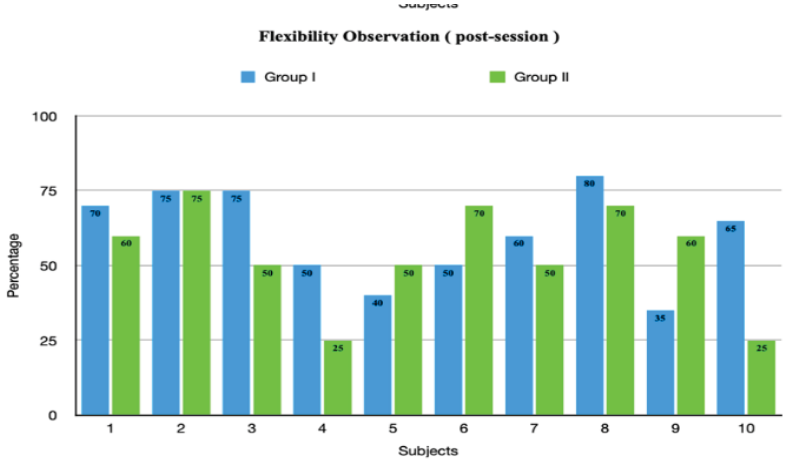

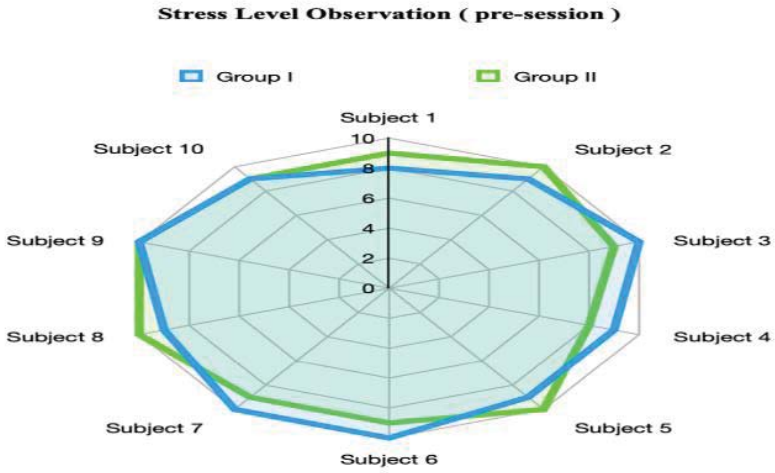

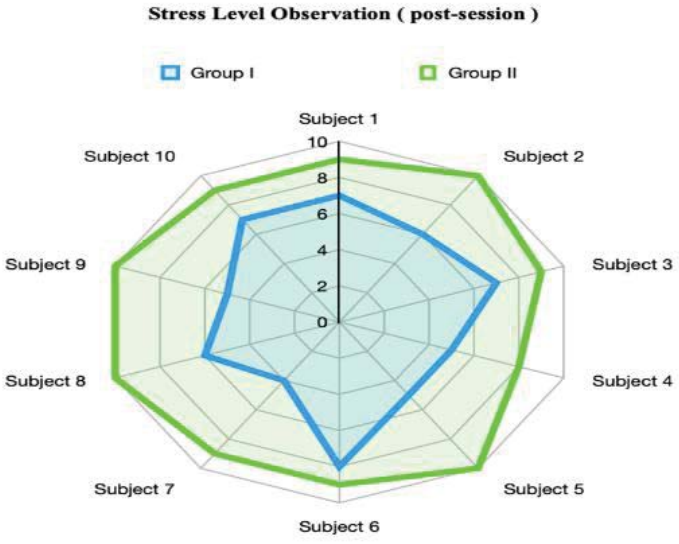

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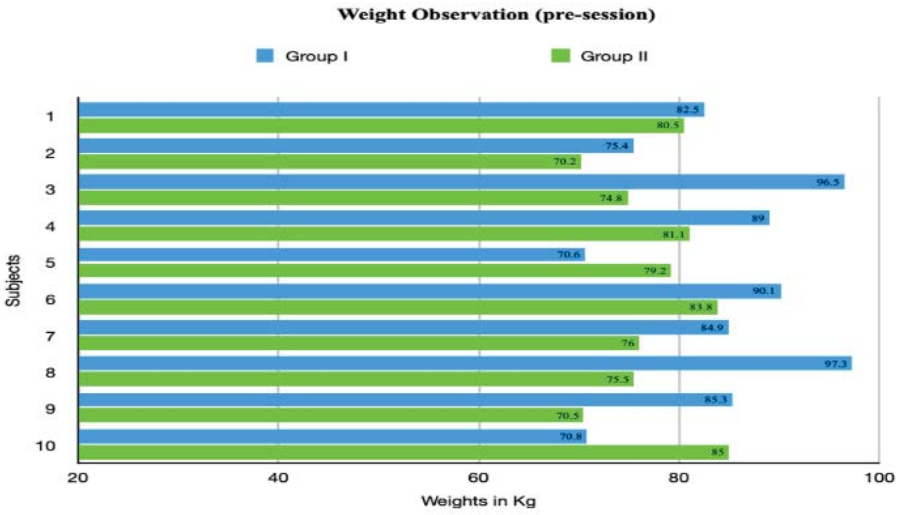

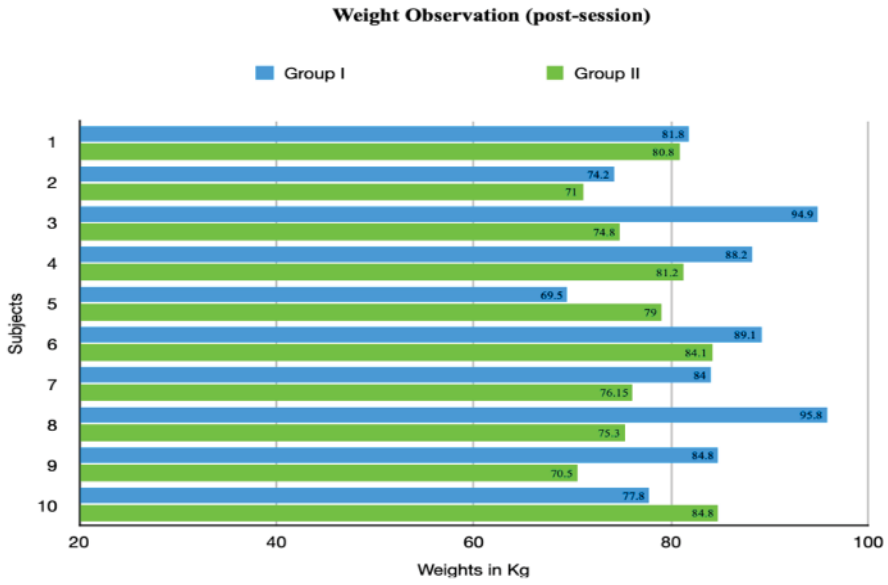

8. CONCLUSION

The effects of yoga on stress levels is pretty evident. With acclimatizing to the fast lifestyle, it is vital to stay fit and healthy considering the disability. Factors like yoga influence the stress levels and overall mood in a positive manner. There have been several studies conducted on the benefits of yoga for people with disabilities, including those who are blind or visually impaired. Overall, our research suggests that practicing yoga can have a positive impact on physical and psychological health, as well as quality of life.

In terms of physical health, yoga has been shown to improve flexibility, coordination, all of which can be particularly beneficial for individuals with disabilities. Yoga can also help to reduce pain and improve sleep, which are common issues among people with disabilities. Psychologically, yoga has been found to reduce stress and anxiety, which improve mood and self-esteem, and enhance overall well-being. For people with disabilities, who may experience greater levels of stress and anxiety due to the challenges they face, these benefits can be particularly important.

The creation of user-friendly and accessible yoga apps for people with disabilities, especially those who are blind or visually impaired, is another crucial factor to take account of. Without relying on an instructor or going to a real class, these applications can give people the chance to practice yoga on their own, at their own pace, and in their own environment. We can empower people with disabilities to take charge of their health and wellbeing, encourage self-care, and foster independence by giving them access to user-friendly yoga apps. This is crucial for those who might have difficulties attending conventional yoga courses due to transportation or schedule challenges or who would want to practice in the quiet and comfort of their own homes.

While more research is needed in this area, the existing studies and our research study suggest that yoga can be a valuable tool for individuals with disabilities, including those who are blind or visually impaired, in promoting physical and psychological health and well-being.

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