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An Indian Boxer

CHRONOBIOLOGY

April 2025



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1. What inspired you to take up boxing, and how has your journey evolved over the years? My father encouraged me to take up boxing. He wanted me to pursue an individual sport. I initially played kabaddi in my village and was even selected for the nationals. However, after my 10th grade, when I decided to pursue a sport professionally, my father advised me to choose an individual sport, which led me to boxing.

I also chose boxing because people at school used to call me a boxer since childhood. Whenever there was an issue, people would come to me for help, and I would step in without hesitation. I wasn't much of a talker, so instead of using words, my fists did the talking.

2. Boxing is physically demanding. How do you manage injuries and recovery throughout your career?

Boxing is indeed physically demanding, and I've faced many challenges throughout my career. To avoid injuries, I focus a lot on strength training. Whenever I feel any pain, I immediately begin strength exercises. Injuries are part of the game, but it's important to pay attention to them and not ignore them. I combine strength training with my boxing routines, specifically targeting the areas where I feel pain, which helps reduce the chances of further injuries. This way, I address injuries before they escalate.

3. As a world champion, what has been your biggest challenge in maintaining peak physical fitness?

Boxing is a strength game, and we do a lot of exercises to improve our fitness. The biggest challenge I faced in maintaining peak physical fitness was not physical, but mental. I had family problems that affected me deeply.

Mentally, it was very difficult to stay fit under those circumstances. While I never had issues with working out, as I trained for twelve hours a day, my family troubles took a toll on my mental well-being, which impacted my physical fitness. Despite the challenges, I continued working hard and eventually became a world champion.

4. What role does physiotherapy play in your training routine and injury prevention?

Physiotherapy plays an extremely important role in every athlete's life, and it has been crucial for me as well. Just like strength training, physiotherapy helps in recovering from injuries. Whenever I have an injury, the physiotherapist strengthens the affected area through targeted exercises. Having a physiotherapist is vital for any athlete. They help prevent injuries by identifying the early signs and suggesting exercises to mitigate potential issues. Often, players don't have enough knowledge about injuries, and physiotherapists educate us about the pain and how to prevent it.

5. Have you ever faced a career-threatening injury? If so, how did physiotherapy help in your recovery?

Yes, I have faced several injuries during my career. One notable instance was during the World Championship when I had a severe groin injury. It was critical, and without the help of physiotherapists, I wouldn't have been able to continue my training. Although I didn't mention the injury to the camp physiotherapists initially, I spoke to my personal physiotherapist, who recommended specific exercises. These exercises helped me recover from the injury, and I eventually went on to win the World Championship. This experience solidified my belief in the importance of physiotherapy in sports.



# SAWEETY BOORA

6. Boxing requires agility, endurance, and strength. Do you incorporate physiotherapy-based exercises to improve performance?

Absolutely. Boxing is a physically demanding sport, and we rely heavily on strength training and exercises recommended by our physiotherapists to improve our performance. These physiotherapy-based exercises help improve agility, endurance, and strength. They are designed to enhance our physical capabilities while preventing injuries, ensuring that we remain in peak condition.

7. What advice would you give young female athletes about maintaining physical health and preventing injuries in boxing?

I would advise young female athletes to pay close attention to any injury, no matter how small it seems. If you feel any pain, consult with a physiotherapist immediately and begin strengthening the affected area. Addressing an injury at its early stage can help it heal quickly. On the other hand, ignoring a minor injury can lead to severe consequences, including surgery, which can delay your recovery and even end your career prematurely. Taking care of injuries from the start is crucial to long-term health and success in sports.

8. Looking ahead, do you see yourself advocating for better sports rehabilitation and physiotherapy access for Indian athletes? Absolutely! Many regions still lack proper physiotherapy facilities, and every sports center should have comprehensive rehabilitation services. I plan to do whatever I can to improve this situation and contribute to the well-being of athletes. I have always advocated for the need for physiotherapists, psychologists, and other support staff. Having a physiotherapist is essential, especially for injury recovery, and I will continue to raise my voice to ensure better access to these facilities for athletes in India.



# THE EFFECT OF GROUP CARDIO KICKBOXING TRAINING AND YOGA TRAINING ON BODY COMPOSITION, CARDIO-RESPIRATORY FITNESS AND QUALITY OF LIFE IN YOUNG OVERWEIGHT INDIVIDUALS- AN EXPERIMENTAL STUDY



**BACKGROUND AND AIM:** Obesity has become a major health problem that has increased the risk of comorbid conditions. There are several forms of exercises designed to reduce obesity and to improve cardiovascular fitness, yet very few studies have compared the effectiveness of cardio kickboxing and yoga in young overweight individuals. So the aim of present study is To compare the effect of group cardio kickboxing training and yoga training on body composition, cardio-respiratory fitness and quality of life in young overweight individuals.

**METHOD:** 30 Young Overweight individuals were taken for the study those who fulfilled the inclusion criteria. They were randomly divided into two groups for the study, Group – A was given group Cardio kickboxing and Group – B was given Yoga Intervention, which was given 3 days a week for 8 weeks.

**OUTCOMES:** BMI, Waist Hip Ratio, Skinfold Measurement, Queens College step Test to assess Vo2 Max, OWLQOL for Quality of life.

**RESULT:** After intervention of 8 weeks, there was significant improvement in BMI, WHR, skinfold, VO2 Max and OWLQOL in within the groups. There was statistically significant improvement in BMI, subscapular, abdominal and suprailiac skinfold and vo2 max scores in participants of cardio- kickboxing group. There was no significant difference in WHR, Triceps skinfold, and OWLQOL scores between groups.

**CONCLUSION:** From the present study, it can be concluded that both interventions are effective in improving body composition, cardio respiratory fitness and quality of life in young over weight individuals. Cardio kickboxing was more effective in improving BMI, subscapular, abdominal and suprailiac skinfold and cardio-respiratory fitness. However both groups were equally effective in improving WHR, triceps skinfold thickness and Quality of life.

**KEYWORDS:** Cardio kickboxing, yoga, obesity, BMI, WHR, skinfold thickness vo2 max, Quality of life, OWLQOL.

## INTRODUCTION

Overweight and Obesity is a condition leading to increase in body weight due to excessive fat accumulation, resulting in to risk for chronic diseases and premature death.<sup>1</sup>

Obesity leads to excessive fat storage under the skin and sometimes internal organs.<sup>1</sup> The prevalence of overweight and obesity is estimated to reach 30.5% (27.4%-34.4%) and 9.5% (5.4%-13.3%) among men, and 27.4% (24.5%-30.6%) and 13.9% (10.1%-16.9%) among women, respectively, by 2040,

Concluding that the prevalence of overweight and obesity will increase considerably in India by 2040. The prevalence of obesity is increasing, especially in developing and newly industrializing countries.<sup>2</sup> The overall prevalence of overweight and obesity in India was noted to be 6.8% and 33.5% respectively in both males and females.<sup>3</sup>

WHO (2014) stated the obesity could initiate various disease such as, cardiovascular disease, musculoskeletal disorder, stroke,

diabetes, hypertension and several kind of cancer.<sup>4</sup> Advancement in Technologies have made our lives inactive. Research concluded that exercise and physical activity are good for our health.<sup>5</sup>

Obesity is caused by many factors such as excessive food intake, genetic, environmental, metabolic, general life style, eating habits and medicines. Other causes includes the increase of cortisol secretion, change in endocrine function, and gastronomic problems.

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Cardiorespiratory fitness (CRF) is ability of heart and lung to transport and deliver adequate oxygen and body's ability to utilize maximum oxygen, causing increased performance without getting fatigue. CRF is compromised in overweight and obese. Obesity is also associated with decreased psychological well-being, reduced social integration, stigmatization, and low self-esteem, which has a negative impact on quality of life.<sup>8</sup>

A regular physical activity can improves cardiovascular fitness and muscular strength and flexibility, lowers the risk for chronic diseases improves sleep and helps in coping with stress, raises levels of energy and job productivity, Extends longevity and slows down the aging process, Improves self-image and morale and helps fight depression.<sup>10</sup> Weight Reduction can be healthily achieved through various physical activities like Aerobics, Yoga, Cardio kick boxing, Aquatic exercises, Zumba, Tae ka Wando, Pilates.

.Cardio kickboxing, is a combination of boxing, martial arts, and aerobics that offers an intense cross training and total-body workout. Noncontact kickboxing is mainly composed of punches and kicks thrown into the air rather than using contact equipment.<sup>11</sup> These include fast, interactive movements of the body and limbs, high-intensity exercises. Sessions are set to music with an instructor leading each class with verbal cuing and demonstration of proper technique. In a typical cardio kick boxing class, a participant can expect to burn average of 350 -450 calories an hour.<sup>12</sup>

Yoga was developed by the sages in India. People have been practicing it since ages as a composite system of physical mental and spiritual discipline. In Sanskrit yoga means-union.<sup>10</sup>It is mainly composed of asanas and Pranayama. Pranayama is a breathing technique that is an integral part of yoga practice. It has been shown to have a positive impact on various physiological and psychological parameters.<sup>14</sup>

There are several form of exercises designed to reduce weight and to improve CRF. Studies have been done to evaluate the effects of yoga in improving body composition. However, very few studies are done to evaluate effectiveness of CKB and Yoga on cardio- respiratory fitness and quality of life. Therefore, the need of this study is to compare the effectiveness of cardio kick-boxing and yoga on body composition, cardio respiratory fitness and quality of life in young overweight Individuals.

## MATERIALS AND METHOD

This study was approved as a less than minimal risk research by the ethical committee of Institution. Prior to the interview, individuals read carefully and signed the consent form, which contains information on the objectives of the study, the selection process, risk, benefits and freedom of the participation, as well as information on confidentiality.

- STUDY DESIGN: An Experimental study
- SOURCE OF DATA: From community
- STUDY SETTING- Gym and College.
- SAMPLING TECHNIQUE: Simple Random Sampling.
- SAMPLE SIZE: 30 (15 in each group) according to power analysis.
- STUDY DURATION: 1 year .

### 2.1 Selection Criteria

Inclusion criteria:

- Individuals willing to participate.
- 18-30 years of age.
- Both the males and females.
- Body Mass Index (BMI) 25.0 – 29.9 Kg/ m<sup>2</sup>
- Individuals who are able to comprehend English language.

Exclusion criteria:

- Physical impairments that preclude participation in exercises.
- Individuals who are participating in any other weight reduction program.
- Currently following weight loss diet.
- Individuals with neurological, cardiovascular, metabolic and psychological disorders.
- Pregnancy or breast feeding period.

## 3. METHODOLOGY:

### 3.1 Outcome measures:

**Body Composition**

#### 1. Body Mass Index<sup>24</sup>

It is defined as persons weight in kilograms divided by the square of the persons height in metres (kg/m<sup>2</sup>)

$$\text{BMI} = \text{Body mass index} = \frac{\text{Body weight (kg)}}{\text{Height(m)}^2}$$

The WHO regards an adult BMI of less than 18.5 as under-weight, while BMI of 25 or more is considered overweight and 30 or more is considered obese.

#### b) Waist Hip Ratio<sup>23</sup>

- The ratio of the waist circumference to the hip circumference and is a ratio between the fat stored centrally inside the abdomen (waist circumference) and fat stored peripherally (hip circumference).
- Waist circumference - Participants are lightly clothed and asked to stand upright with feet together. The measure tape is fitted around the abdominal without compressing soft tissue. The waist circumference is measured as the smallest girth around abdomen.



- Hip circumference -Hip circumference is measured as largest girth measured around buttocks.

Reliability for waist hip ratio is  $r = 0.904$

#### c) Skinfold Measurement<sup>23</sup> –

- It measures the thickness of subcutaneous fat at various sites of body using a digital skinfold caliper with reliability of 0.86-0.93.
- It is measured on right side of body with subject in standing position. An average of 2 -3 measurements at each site is taken, which represents the skinfold score.
- Anatomical location for skinfold sites are;
- Triceps – vertical fold at posterior midline of upper arm, halfway between the tip of shoulder and tip of elbow. Elbow remains in an extended, relaxed position.
- Subscapular- oblique fold just below the bottom of scapula.
- Suprailiac- slightly oblique fold just above the iliac crest. The fold follows the natural diagonal line.
- Abdomen- vertical fold 1 inch to the right of umbilicus.
- Thigh- vertical fold at the midline of the thigh, two-thirds of the distance from the middle of patella (knee cap) to hip.

## Cardio Respiratory Fitness

### VO2MAX.7

- It was estimated by Queen's College Step Test [QCT] method. This test was performed using a tool of 16.25 inches height.
- Stepping was done for a total duration of 3 minutes at the rate of 24 steps up per minute for males and 22 steps up per minute for females set by a metronome. After completion of exercise, the carotid pulse rate was measured from the fifth to the twentieth second of recovery period. The 15 seconds pulse rate was converted into beats per minute and following equation was used to predict VO<sub>2</sub>max .
- For males: VO<sub>2</sub>max = 111.33 - [0.42 × pulse rate beats/min]
- For females: VO<sub>2</sub>max= 65.81-[0.1847×pulse rate beats/min] [ml/kg/min].

## Quality of Life.9

Weight-Loss Quality-of-Life (OWLQOL) questionnaire was used to measure quality of life. It has good reliability of 0.93. It is associated with general QoL, mental and physical well-being, and weight-related symptom bother. the OWLQOL contains 17 items.

Responses are indicated on a seven-point scale that ranges from 0 ("not at all") to 6 ("a very great deal"). Scores are transformed to a 0 to 100 scale, with higher scores indicating higher obesity specific QoL

## 3.2 Procedure:

35 participants were screened for inclusion and exclusion criteria. 30 Subjects meeting the inclusion criteria and willing to participate in the study were included in the study. A written informed consent form was taken from the subjects.

The subjects were divided into 2 groups –

- GROUP A (n=16). Participants were given cardio-kickboxing intervention. GROUP B (n=16). Participants were given yoga intervention.
- Height, weight, waist circumference, hip circumference, skin fold measures were taken for body composition.
- Queens college step test was performed by all participants and values of VO<sub>2</sub> max were noted.
- OWLQOL questionnaire form were filled up by all participants before intervention
- Both group sessions were conducted for 45-60 mins 3 days a week for 8 weeks.

Group A- Group Cardio Kick boxing exercises are performed with music

- Intervention was given for 45 mins, 3 days a week for 8 weeks.<sup>23</sup>

Warm up (5-7 mins)- Marching, reaching pulling, stepping side to side, knee bending and swaying movements, gentle trunk rotation and flexion extension of lumber spine.

Aerobic exercise (25-30 mins)- Consists of kick, punches, stance and squats performed alone or in combination.

Cool down- Gentle aerobic moves and Stretching

### GROUP B: Group Yoga Intervention was given for 45 mins, 3 days a week for 8 weeks.<sup>3</sup>

**Warm up- 5 mins:** Forward bend, backward bend, side bend, trunk twist, Surya namaskar 10 mins

**Asanas -30 mins:** Tadasan, trikonasan, uttanasana, bhujangasan, Sarpasan, salabhasan, Markatasan, uttanpadasan, Matsyasan, vajrasan, vakrasan, pasachimauttasan, Padmasan

**Pranayama - 5 mins:** Kapalbhati, bhastrika pranayama, Nadi suddhi

#### Relaxation- shavasana-

Progressive muscle relaxation, yoga nidra

Meditation- breathing meditation

All exercises will be performed slowly and cautiously.

Detailed intervention is described in table and figure section.

## 4. RESULTS

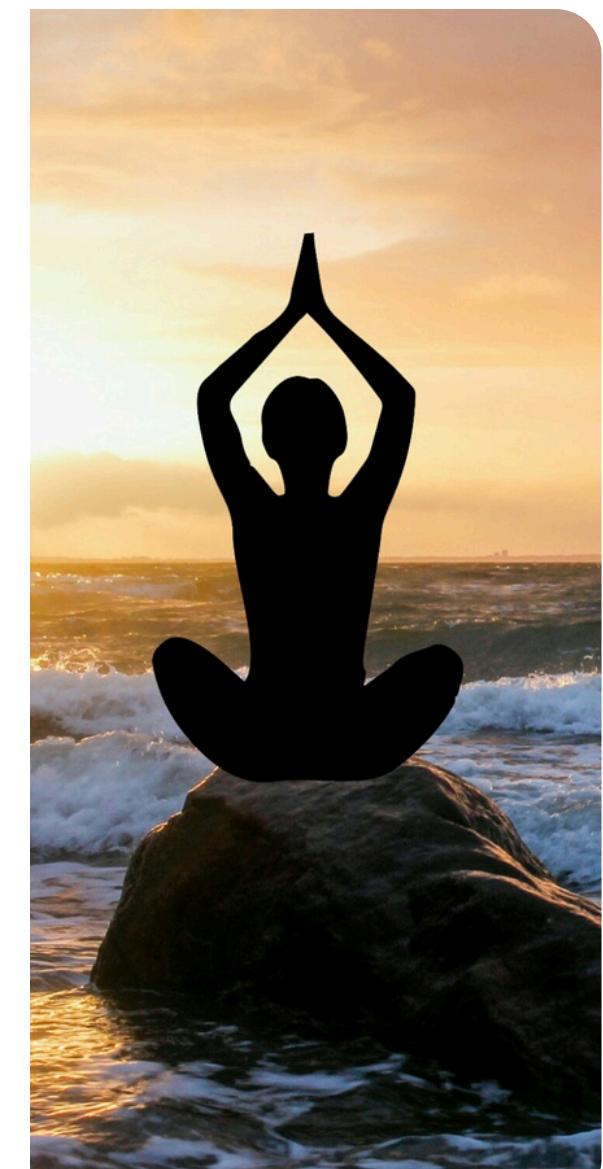
The present study was conducted to compare the effects of Group cardio kick-boxing and yoga on body composition, cardio- respiratory fitness and quality of life in young overweight individuals. Data of 30 Individuals were analyzed by using Statistical Package for Social Science version 20 (SPSS v.20) and Microsoft Excel 20

Total 30 individuals were included in the study out of which 15 participated in the cardio kick-boxing and rest 15 participated in the yoga intervention. Data analysis was done on the outcomes:

- Body Mass Index
- Waist hip ratio
- Skin fold thickness- triceps, subscapularis, abdominal, supra- iliac and thigh by digital caliper.
- Cardio respiratory fitness- Vo<sub>2</sub> max by Queens college step test.
- Quality of life - by Obesity and Weight-Loss Quality of Life (OWLQOL) questionnaire.

Data of 30 Individuals were analyzed by using Statistical Package for Social Science version 20 (SPSS v.20) and Microsoft Excel 2016, With significance level of statistical analysis is p <0.05.

Normality of the data was checked using Shapiro - wilk test of normality. Since most of the data was not normally distributed, so non-parametric tests were used. Wilcoxon signed rank test was applied to analyze pre and post outcome measures within group, while between group analyses was done using Mann Whitney U test for all outcome measures



## 5. DISCUSSION:

The present study was conducted to compare the effects of Group Cardio-Kickboxing and Group Yoga training in Young Overweight individuals. Result showed statistically significant improvement in Body Mass Index, Waist Hip Ratio, Skinfold Measures, VO<sub>2</sub> Max, and Quality of life scores, within group (p<0.05).

Group A which received Cardio- kick boxing showed statistically significant improvement in Body composition, Cardio- respiratory fitness and Quality of life in young overweight individuals.

The Mechanism behind Improvement in these scores was; There is increase in muscle's capacity to use intramuscular triacylglycerol due to greater blood flow within trained muscles. The capacity to mobilize and oxidize fat increases leading to increases energy expenditure which in turn helps in reducing the body fat.<sup>4</sup> Similar findings found in study done by Diako et al in (2020) who evaluated effect of 8 weeks cardio kickboxing on cardio respiratory endurance, body composition and quality of life of male students living in dormitories.<sup>5</sup>

There was statistically significant improvement found score cardio- respiratory fitness in CKB. Kickboxing includes Constant and successive foot moves, jumps, bendings, and punches, which has a positive contribution to aerobic power during the kickboxing training, owing to increase in VO<sub>2</sub> max due increase in muscle oxidative capacity and increase the heart potency to pump blood.<sup>55</sup> The results of this study are supported by research conducted by Farzaneh, et al who studied the effect of Aerobic Training on Lipid Profile and VO<sub>2</sub> Max in 20 Sedentary Overweight Females.<sup>21</sup>

There was statistically significant improvement in OWLQOL scores in CKB. Secretion hormones like serotonin and dopamine, produced as a result of aerobic exercises, are effective in cheerfulness, happiness, self-confidence.<sup>19</sup> Diako Heiday et al in 2020 in a study showed that cardio kickboxing workout among boys living in the dormitory was associated with improved cardiorespiratory endurance, body composition, quality of life, and sleep quality.<sup>18</sup>

Group B which received Yoga intervention, showed statistically significant improvement in Body composition, Cardio- respiratory fitness and Quality of life in young overweight individuals.

Asanas involving backward bending and twisting postures stimulate the thyroid and adrenal glands as well as causes increase in BMR and increases utilization of food, enhancing glycolysis.<sup>16</sup> The results of this study are supported by research conducted by Khan S et al in 2022, showing that yoga for a period of six weeks had a significant reduction in waist circumference, waist-hip ratio and BMI.<sup>20</sup>

VO<sub>2</sub> Max significantly improved in yoga Group. pranayama causes increase in blood flow to the heart, and modulation of heart rate variability improving lung function and O<sub>2</sub> utilization at cellular level.<sup>14</sup> Study done by pranali et al in 2023 who evaluated the effect of pranayama on stress level and vo<sub>2</sub> max in mbbs students showed similar results<sup>14</sup>

There was statistically significant improvement found in OWLQOL score in yoga Group. Practicing yoga gives specific emphasis to body awareness and responsiveness to self objectification leading to better self-esteem in yoga experienced obese persons. Manoharan et al in 2021, evaluated the effect of yoga on perceived stress, anxiety, quality of life, and heart rate in obese individuals, showed similar results.<sup>17</sup>

Results of present study showed that Group A (Cardio- kickboxing) showed more statistically significant result in reducing BMI, Suprascapular, abdominal, suprailiac and thigh skinfold, and improving cardio respiratory fitness. Both groups were equally effective in improving Waist Hip ratio, Triceps skin fold and Quality of life.

Similar findings found in study done by Loitongbam Sujata devi et al (2021), who compared the effects of aerobics and yoga training on Body Composition among sedentary women of Manipur. Results showed that aerobics exercise was more effective in improving BMI and fat percentage.<sup>22</sup>

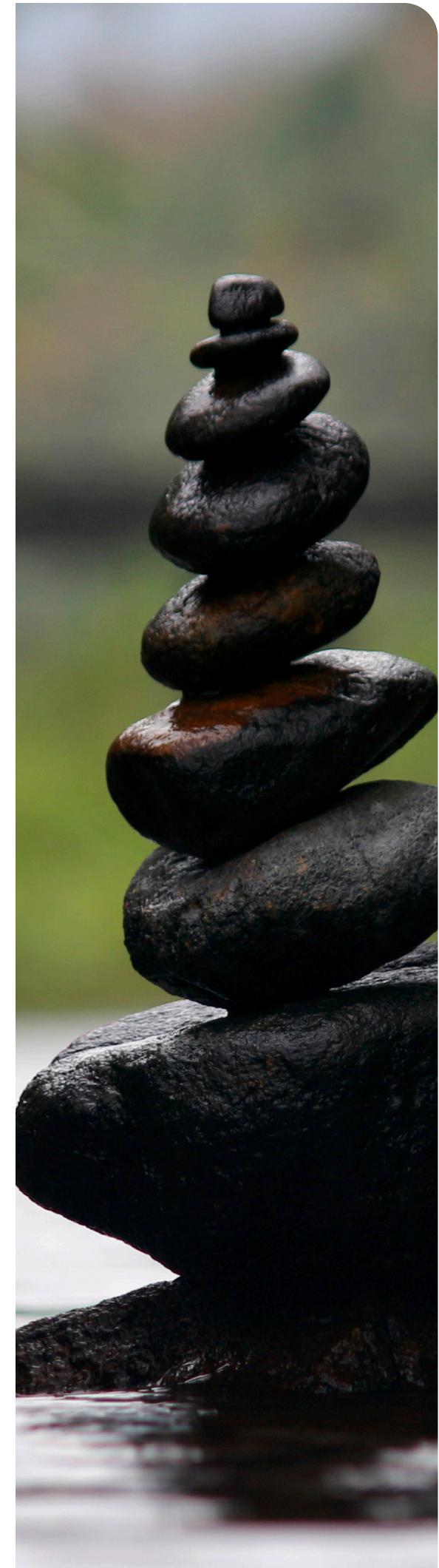
This was also supported by Wilmore study, cited by Pantelic S et , who studied effect of twelve week aerobic exercise on body composition parameters in young women. It describes that exercise intensity from 50- 80% for up to 12 weeks atleast 3 days a week was effective in maintainance of body mass, BMI and fat reduction.<sup>24</sup>

A Bhaskar et al, in 2019 conducted a study on Impact of Aerobic Training and Yogic Practices on Cardio Respiratory Endurance of Obese College Men, concluding that cardio respiratory endurance was highly developed in Aerobic training group when compared with and yogic practices group.

Both interventions were equally effective in improving Quality of life in young overweight individuals. Mohammad Ebrahim et al in 2014 conducted a study to investigate the effects of an eight-week aerobic exercise on the quality of life as well as physiological indicators of cardiovascular endurance of inactive high school male students in Kashan. The results verified the positive effect of aerobic exercises on the quality of life as well as fitness indicators in inactive student.<sup>19</sup> Similar findings found In study done by Manoharan et al 2021, who evaluated the effect of yoga therapy on perceived stress, anxiety, quality of life, and heart rate in obese individuals<sup>17</sup>

## 6. CONCLUSION:

The result of the present study on 30 young overweight individuals has rejected H<sub>01</sub>, H<sub>02</sub>, H<sub>3</sub>, H<sub>4</sub>, H<sub>5</sub>, H<sub>06</sub>. It can be concluded that after 8 weeks of of intervention, both cardio kickboxing, and yoga were effective for improving Body composition, cardio respiratory fitness and quality of life in young over weight individuals, But Cardio kick boxing was more effective in improving BMI, Subscapular, Abdominal, Supra-iliac and Thigh skin folds and VO<sub>2</sub> Max scores, compared to yoga. However, Both the interventions were equally effective in improving Waist Hip ratio, Triceps skinfold and Quality of life in young overweight individuals.



## INTRODUCTION

Human body is adapted to changes in its internal environment, simultaneously with the variations in the external atmosphere, the external day and night, is represented internally as biological day and biological night. These both can be characterised and assessed by the hormonal variations, protein formation, variations in gene expression, electrophysiology and altered behaviour. These characteristics can vary with different seasons, conditions, stress, exertion, occasion, pressure of any competition.

Basically all these associated factors, can be compiled into a more broader term known as „Chronobiology”, meaning study of the biological rhythms and its effects on the human body, affecting the mental wellbeing and physical performance metrics, in field of sports, such that both these components are the essential parameters for evaluating the general wellbeing of a player.

Therefore circadian rhythm plays an important role in the maintenance and improving the performance of an athlete. Due to performance pressure, during the competitions, athletes practice overtime, resulting in alteration in their sleep wake cycle, causing variation in memory consolidation and metabolic functions, this may result in the problems regarding peak performance, with decreased mental and physical wellbeing.

Previously, the myth related to sleep, as an inactive process, is being replaced by the active cum dynamic state essential for the proper chemical reactions in the body, sustaining the normal body functions.

# ROLE OF SLEEP AND CHRONOBIOLOGY ON THE OVERALL PERFORMANCE OF AN ATHLETE



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## CHRONOBIOLOGICAL FACTORS AFFECTING SPORTS PERFORMANCE

Alterations in the sports performance, can be the result seasonal rhythms dividing the athletes into morning chronotypes, described as the individuals active during early morning with more advancing bedtime in comparison to the evening chronotype and vice versa for evening chronotypes depending on the gene variations. Therefore, to train the athletes, their chronotype should be focussed through detailed history or by conducting researches by giving training in the particular time of the day and then assessing their performance, evaluating their circadian rhythm.

Other factors like, photoperiod or day length also influence the psycho performance related behaviour of an athlete, resulting in more lethargy in decreased photoperiod such as during winters. Furthermore, this can be managed through bright light treatment, with subjection to bright light during morning to 10,000 lux of light, decreasing the chances of seasonal mental suppression and enhancing their performance.

Another component, menstrual cycle encompassing the menstrual, follicular, ovulatory and luteal phases, also causes some physiological variations, influencing the chronobiology of a female athlete due to hormonal fluctuations and changes in protein synthesis. Therefore, training should be designed by focussing on the physiological alterations during menstrual cycle affecting the performance of the female athlete.

## EFFECTS OF SLEEP ON SPORTS PERFORMANCE

As sleep is essential for the overall performance of an athlete, a study was conducted by Sargent et al. in 2014, discovered that 6 hours and 12 minutes of sleeping period in Olympic swimmers during high intensity training is important and it helped in their performance improvement. Reduced sleep duration (5-7 hours), may result in deficient cognitive functions, affecting the focus and concentration of the athletes during competitions. It may also cause feeling of sleepiness and pre-competition fatigue. In the other study by Kamdar et al. in 2004 the sleep duration from 7-8 hours resulted in increased reaction time and lower day time sleepiness and fatigue.

The athletes, practicing short duration sleep after intense continuous training, without sufficient naps in between may develop sleep inertia. If the morning type individual, sleeps late at night and had an early morning practice, then it can develop sleep inertia which may last for about 2-4 hours, and if the athlete practices in that duration then the performance will decrease. Comparing an elite and experienced athlete in his sleep inertia state competing with a not so experienced athlete in a normal state, maintaining his sleep rhythms well, may face a deterioration in his performance in terms of speed, reaction time, agility and coordination.

Sleeping disorders like insomnia, sleep apnea, jet lag, mood fluctuations should also be considered in an athlete and a detailed history should be obtained and accordingly objectives for their management should be formulated.



Jet lag may also be a major concern for the cause of biased performance of the athletes. It is a proves to be an advantage, for the home team of a particular country where the tournament is being held because the players are already adapted to that particular environment and might be a disadvantage for the other teams coming from the other countries. Therefore, a particular duration should be given to the teams before the competitions, so that they can find some coping strategies to overcome jet lag, by adjusting to the time zones through advancing or delaying of the time duration through exposure to light, making adjustments in the circadian rhythm.

#### RECOMMENDATIONS FOR SPORTS EXPERTS

Taking all the important facts and findings of the sleep and chronobiology into consideration, a detailed evaluation of the sleep wake cycle should be added into the sports specific assessment formats. The degree of sleepiness and its duration can be assessed through various subjective and objective questionnaire for eg: Pittsburg sleep quality index and Polysomnography respectively at high performance centers. Smart watches, and actigraphs can also be used to evaluate to derive sleep-wake parameters assessing the circadian rhythm.

Coaches, trainers, sports physiotherapists, sports scientists, should take into account the knowledge of sleep cycles and circadian rhythm of an athlete, alongwith its effect on their performance, designing their training protocol according to the individual needs of an athlete. Their wake maintenance zones should be demarcated, underlining the morning or evening chronotype. Wake maintenance zone basically is that part of the day when possibility of falling asleep is the lowest. This basically includes the late afternoon and early evening before evening onset of melatonin. Therefore, training and competitions should be held in that part of the day.

Also morning hours training can also be scheduled as cortisol peaks in the morning which may increase the intensity to exercise. To cope up with the effects of sleep inertia, a nap between the high intensity training can be recommended that had displayed improvement in alertness, cognitive performance, but it should not be more then 30 min, otherwise it may lead to deep sleeping phase and waking up from that might cause a state of diminished thinking capacity, putting an athlete into physiologic sleep inertia.<sup>1</sup>

Those who are suffering from some sleep disorder may promote their sleep onset by acquiring an inverted sleep posture, motor relaxation through stretching techniques, sensory withdrawal from particular light, breathing techniques, and cognitive relaxation.

Therefore, this emerging field in sports science focussing on sleep rhythms and chronobiology can identify the hidden reasons of performance decrement and through proper management the lacunae can be overcome.



# Optimizing AI for Tele-cardiac Rehabilitation: Enhancing Patient Outcomes and Efficiency



## Introduction:

Tele-cardiac Rehabilitation (TCR), a burgeoning field harnessing technology to deliver cardiac rehabilitation remotely, holds immense promise in extending care to individuals with cardiovascular conditions. It also offers a novel approach to overcoming traditional in-person cardiac rehabilitation barriers, such as accessibility constraints and limited resources.

Leveraging AI in this context presents opportunities to tailor interventions, monitor patients remotely, and provide timely feedback, thereby potentially improving adherence and outcomes. Engaging stakeholders, including patients, clinicians, and technology developers, in the design process facilitates the creation of solutions that address real-world needs and preferences.

Furthermore, AI-driven automation streamlines administrative tasks enhances resource allocation, and fosters scalability, thereby increasing the reach and cost-effectiveness of tele-cardiac rehabilitation programs. By harnessing the power of AI, tele-cardiac rehabilitation can evolve into a highly effective and efficient model of care delivery, transcending geographical barriers and revolutionizing cardiovascular health management.

In India, several AI-powered apps for tele-cardiac rehabilitation are available, catering to the diverse needs of patients recovering from cardiac events or surgeries.

## AI Apps available for enhancing Tele-cardiac Rehabilitation:

- **Cardiotrack:** Cardiotrack is an AI-powered telemedicine platform that offers remote cardiac monitoring and rehabilitation services. It allows patients to track their vital signs, including ECG, blood pressure, and heart rate, through a smartphone app. Healthcare providers can remotely monitor patients' progress and provide personalized rehabilitation guidance.
- **CardioCradle:** CardioCradle is a mobile application designed for cardiac rehabilitation and prevention. It offers personalized exercise routines, dietary guidance, stress management techniques, and educational resources to help patients manage their cardiac health. The app uses AI algorithms to analyze user data and provide tailored recommendations.
- **Portea:** Portea is a home healthcare service provider in India that offers tele-cardiac rehabilitation programs. While not exclusively AI-powered, Portea utilizes technology and remote monitoring to deliver personalized rehabilitation plans, medication management, and lifestyle counseling to patients recovering from cardiac conditions.

## Benefits of using AI in Tele-cardiac Rehabilitation:

- **Personalization:** AI can tailor rehabilitation programs to individual patient's needs, considering factors like medical history, fitness level, and progress. This personalized approach can lead to more effective outcomes.



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- **Accessibility:** AI enables patients to access support and guidance remotely, overcoming barriers such as distance, transportation issues, or mobility limitations.
- **Convenience:** Patients can complete rehabilitation exercises at home or in their preferred environment, eliminating the need for frequent visits to healthcare facilities encouraging adherence to the program and long-term engagement.
- **Continuous Monitoring:** AI-enabled apps can monitor patients' progress in real-time, allowing healthcare providers to track adherence, adjust treatment plans as needed, and intervene promptly in case of complications or setbacks.
- **Education and Engagement:** AI apps can deliver educational content in engaging formats, helping patients understand their condition, treatment options, and lifestyle modifications. This increased knowledge empowers patients to take an active role in their recovery.

#### Drawbacks of using AI in Tele-cardiac Rehabilitation:

- **Technological Barriers:** Not all patients may have access to the necessary technology or be comfortable using AI-powered apps hence creating disparities in healthcare access and limiting the effectiveness of tele-cardiac rehabilitation for certain populations.
- **Lack of Human Interaction:** While AI can provide personalized support and feedback, it cannot replace the human connection and expertise of healthcare professionals. Some patients today also prefer to have face-to-face interactions with their care team.
- **Data Privacy and Security:** AI apps collect and analyze sensitive health data, raising concerns about privacy and security. Ensuring compliance with regulations such as HIPAA (in the United States) is crucial to protect patients' confidentiality and prevent unauthorized access to their information.

- **Algorithm Bias and Accuracy:** AI algorithms are only as effective as the data they are trained on. Biases in the training data or inaccuracies in the algorithms could lead to incorrect recommendations or disparities in care, particularly if the AI is not validated for diverse patient populations.
- **Dependence on Technology:** Relying heavily on AI for tele-cardiac rehabilitation may undermine patients' self-efficacy and independence in managing their health. It's important to strike a balance between leveraging technology for support and fostering patients' self-care skills.

With the greater benefits available for optimizing AI in tele-cardiac rehabilitation, continued research, collaboration, and innovation, the optimization of AI in tele-cardiac rehabilitation will pave the way for a future where cardiac patients would receive tailored, accessible, and impactful rehabilitation services, ultimately improving quality of life and reducing healthcare disparities with careful consideration of potential drawbacks making it essential to ensure equitable and ethical implementation.



# INJURY PROFILING IN RUGBY & THEIR PREVENTIONS

## Introduction

Rugby is a fast moving and higher intensity team sport, Americans often compare rugby to "football without peds," and with good reason. American football and rugby have a common origin dating back to the mid-1800s.

Below is a graph to show the most common areas injured while playing rugby – it shows that the lower limbs are injured more regularly than anywhere else. Typical injuries include ankle and knee ligament sprains, hamstring and rotator cuff muscle strains, dead legs, shoulder dislocations and concussion.

## Common injuries

- Head & Neck Injuries (Concussions and neck strains )
- Upper Body Injuries (Shoulder separations, dislocated fingers and rotator cuff injuries are frequently seen in rugby.)
- Lower Body Injuries ( The lower body is susceptible to various injuries, including- Hamstring strains, Knee ligament injuries and Ankle sprains.)



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## ON- FIELD PROTOCOL

- Train your hamstrings to protect your knees (Include effective eccentric exercise training (slow and controlled)+ hamstring stretching. Our hamstrings may be the most commonly injured muscle group when it comes to playing rugby)
- Maintain effective lats function (to extend and stabilise the shoulders. Allowing for mobility and control through range is also key so training the lats with moves such as hanging leg raises and over-head squats can also increase function)
- Look after your spine (by training your neck muscles and maintaining hip mobility. Simple shrugs are a good place to start oga provides many useful movements to decompress your spine and increase the flow of fluid around the discs)
- Protect your calves (Effective strategies include strength training through calf raises, calf and ankle mobility through range by working uphill and by maintaining good ankle and calf flexibility)
- Prioritise recovery & nutrition (The most important part of training is recovery to allow your muscles to adapt and recover effectively the post match rehab, and eating a well balanced diet will help keep you focussed and on form and not fatigued, which increases the risk of injury significantly)
- Concentrate on tackling technique (In amateur rugby, studies have shown that contact with other players accounts for the majority of injuries, with the tackler being more at risk than the player being tackled)
- Warm up properly (Warming up prior to training and matches is vital in order to prepare your muscles and cardiovascular system. This is particularly evident in the hamstring muscles, which are often strained or torn during rugby due to the high speed, stop-start nature of the sport)
- Improve your fitness levels (Research has shown that the majority of injuries happen during the second half of a match. This is when players are getting tired and their technique suffers as a consequence. Improving your fitness levels will allow you to play for longer before you reach this stage, and therefore help to reduce the risk of injury that comes with poor technique. Unfortunately, there is no easy way to improve your fitness levels, this comes with effort and time, Make sure you are attending the training sessions and putting 100% effort in to get the best rewards)
- Electro therapy-( use of Muscle stimulators, such as transcutaneous electrical nerve stimulation (TENS) machines, can be used in rugby training to help prevent injuries, relieve pain, and speed up recovery)

What should a player do after the first 3 days?

After this time, and for the next 7-14 days the injury needs LOVE:

(L) Load - let pain guide your gradual return to normal activities. Your body will tell you when it's safe to increase load.

(O) Optimism - condition your brain for optimal recovery by being confident and positive.

(V)Vascularisation - choose pain free cardio-vascular/aerobic activities to increase blood flow to repairing tissues.

(E) Exercise - restore mobility, strength and balance by adopting an active approach to recovery.

## Initial Assessment

The physiotherapist team will conduct a thorough assessment to understand the nature and extent of the injury. This may involve evaluating your range of motion, strength, flexibility and any specific functional deficits related to the injury.

1. Anthropometry
2. Bronco Test
3. Vertical Jump Test
4. 40 m Sprint Test
5. 5-0-5 Agility Test
6. 12 × 20 m Repeat Sprint Ability Test
7. Yo-Yo Intermittent Recovery Test or Multistage Shuttle Run Test
8. 1RM Strength Test



## Abstract

This case study explores the successful management of posterior tibialis tendon dysfunction

(PTTD) in a 23-year-old male with a history of cubonavicular coalition surgery and associated flexible flatfoot. Despite surgery, the patient experienced persistent pain, swelling, and limited mobility due to myofascial trigger points. A multimodal treatment session incorporating intramuscular electrical stimulation, dry needling, manual therapy, and therapeutic exercise led to a 90% pain reduction and improved function. This case emphasizes the interconnectedness of cubonavicular coalition, PTTD, flatfoot, and myofascial trigger points, highlighting the importance of comprehensive treatment strategies.

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### Treatment

The patient received a single treatment session incorporating the following interventions:

□ Intramuscular electrical stimulation (IMES) with dry needling: This combined approach targeted trigger points and improved muscle function in the posterior tibialis muscle.

□ Manual therapy: Techniques like trigger point release and ischemic compression addressed pain and tight muscle fibers.

□ Therapeutic exercise: A program was prescribed to enhance strength, flexibility, and proprioception in the affected ankle, including specific exercises to address the patient's flatfoot. These exercises focused on strengthening the intrinsic foot muscles, improving ankle mobility, and supporting the arch.

The patient tolerated the treatment session well.

### Introduction

Cubonavicular coalition, a rare congenital condition marked by an abnormal bony or fibrous connection between the cuboid and navicular bones in the foot, can cause pain, stiffness, and instability. Surgery is often recommended for symptomatic cases.

However, post-surgical complications such as PTTD, flatfoot (in this case, flexible flatfoot), and myofascial trigger points can arise. Underlying foot biomechanics associated with cubonavicular coalition may contribute to the development of PTTD. Myofascial trigger points, frequently present in PTTD, can exacerbate pain and limit function.

### Case Description

A 23-year-old male presented with six months of pain, a flat foot with swelling, and functional limitations in his right ankle Figure 1&amp;2. He had undergone surgery for cubonavicular coalition and calcified posterior tibialis tendonitis six months prior Figure 3. Post-surgery, the patient continued to experience pain and difficulty bearing weight on the affected leg.

Examination revealed tenderness at the surgical site, reduced ankle dorsiflexion, and difficulty standing on his toes. Based on these findings, the patient was diagnosed with PTTD.



# Effective Management of Posterior Tibialis Tendon Dysfunction Following Cubonavicular Coalition Surgery: A Multimodal Approach Case Study

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#### Outcome

Following the treatment, the patient reported significant symptom improvement. He experienced a 90% reduction in pain (VAS score from 9/10 to 2/10) and demonstrated improved weight bearing and gait on the affected leg. These results suggest the effectiveness of the multimodal approach in alleviating PTTD symptoms.

#### Discussion

This case study showcases the potential for rapid PTTD improvement using a comprehensive approach that combines IMES with dry needling, manual therapy, and therapeutic exercise. This combination may address pain, muscle dysfunction, and movement limitations associated with PTTD.

Further research is necessary to investigate the long-term efficacy of this approach and compare it to other PTTD treatment options. Additionally, future studies could explore the role of other factors, such as footwear or activity modification, in patient recovery.

#### Limitations

This case study's limitations include its retrospective design and the involvement of only one patient. Further research with larger patient groups is needed to confirm the generalizability of these findings.

#### Conclusion

This case study suggests that a multimodal treatment approach, including IMES with dry needling, manual therapy, and therapeutic exercise, may effectively manage PTTD symptoms following ankle surgery. Further research is needed to investigate the long-term efficacy of this approach and compare it with other treatment options.



# The Science of Breathing Under Pressure: The Valsalva Maneuver Explained

The Valsalva maneuver is the natural reaction to heavy lifting or static duties and is defined as the act of exhaling against a closed glottis. It is accurate to say that during resistive activity, the Valsalva maneuver causes a noticeable increase in systolic blood pressure.

The various stages of a lift closely correspond to the breathing patterns used during resistance training. Breathing in during the eccentric phase and out during the concentric phase A quick Valsalva maneuver, or forceful exhalation against a constricted glottis, is inevitable when lifting heavy objects, though.

In a similar vein, the Valsava maneuver must be activated as motor units gradually wear out when lifting lighter loads repeatedly till failure. These findings imply that the Valsalva maneuver is an innate reaction that is activated during resistance training when higher levels of effort are needed.

The variations in blood pressure and pulse that take place throughout the strain phase of the manuver as well as during the recovery phase following the release of the strain are referred to as the Valsalva response.

The main aim of reflex mechanisms' primary goal is to regulate arterial blood pressure. They work mainly by receiving signals from baroreceptors, but they also take into account the activity of pulmonary stretch receptors and, to a lesser extent, chemoreceptors.

Depending on the stage of the maneuver, various mechanisms may act in concert or antagonistically.

Although the Valasava maneuver can temporarily improve muscle function via internal stabilisation, people with hypertension and cardiac impairment should avoid it since it has the unintended side effect of raising blood pressure.

The proposed benefit of the Valsalva maneuver cause an increase in intrathoracic pressure with collapse of veins of the chest wall; there is a decrease in blood flow through the heart, a decrease in venous return, and a drop in blood pressure. When breath is released, intrathoracic pressure decreases, and venous return is suddenly overshot; the mechanism compensates and drops in blood pressure

During resistance exercise, increased stability of the spine due to augmented intra-abdominal pressure demonstrated that spinal stiffness, thus stability, is increased when intra-thoracic pressure is elevated.

Stability of the spine is important during exercises requiring squats, leg presses, and high axial loading to support loads. The Valsalva manoeuvre pressurises the abdominal cavity through a combination of diaphragm, abdominal, and pelvic floor muscle activity. the experienced resistance trainer by maintaining proper vertebral alignment and support and reducing lower back injury risk However, the effect of the Valsalva manoeuvre on intrathoracic pressure has not been systematically evaluated.

Furthermore, the Valsalva maneuver is associated with a pronounced rise in systolic blood pressure, and individuals with a history of heart and cardiovascular disease are advised to avoid the Valsalva maneuver during resistance exerciseCompared to free breathing and not using the Valsalvamaneuver, the blood pressure elevation during resistanceexercise was more pronounced when the Valsalva manoeuvre was used.

The current data, however, indicate that the Valsalva maneuver alone produces more severe haemodynamic responses than the Valsalva maneuver during resistance training.

The length of strain and the depth and rate of the previous breath are two variables that influence the haemodynamic reactions to the Valsalva maneuver, as was covered in a recent review on the cardiovascular consequences of the Valsalva maneuver. Despite the fact that the Valsalva maneuver alone raises circulatory strain due to elevated intrathoracic pressure,coupled resistance exercise does not worsen these effects.



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**The Valsalva maneuver in patients with pulmonary disease increases intrathoracic pressure from the Valsalva maneuver closing off small airways and causing shortness of breath.**

#### **Phase 1 onset of straining**

It is associated with a transient increase in blood pressure because of the emptying of some blood from a large vein and pulmonary circulation; heart rate does not change in this phase.

#### **Phase 2 phase of straining**

It occurs when a decrease in the venous return to the heart is caused by positive intrathoracic pressure. Stroke volume decreases due to decreased venous return and decreased preload; this lowers blood pressure, which in turn activates the baroreceptors in the aortic arch and carotid sinus. Blood pressure returns to normal in healthy people as a result of vagal withdrawal and enhanced sympathetic discharge, which causes noticeable tachycardia, cardiac output, and vasoconstriction.

#### **Phase 3 release of straining**

It is the transient phase in the release of strain, which leads to a decrease in blood pressure. The drop in blood pressure is caused by the expansion of the pulmonary vascular bed and reduction of the left ventricular cross-sectional area.

#### **Phase 4 in recovery phase**

Overshooting of blood pressure occurs due to stimulation of the baroreflex, leading to bradycardia and return of blood pressure.

In around one minute, your rapid heartbeat will decrease if the Valsalva maneuver is successful, which occurs 5% to 20% of the time. After three attempts, your doctor will move on to the next phase of treatment if it doesn't stop your supraventricular tachycardia. These measures could involve electric cardioversion, carotid massage, or medication, depending on your symptoms, vital signs, and the kind of supraventricular tachycardia you have.

#### **Clinical significance:**

##### **Heart failure:**

When evaluating cardiac failure, the Valsalva maneuver is helpful. Due to compromised ventricular function, patients with heart failure exhibit an aberrant overshoot in blood pressure when performing the Valsalva maneuver

##### **Arrhythmia:**

With varying degrees of efficacy, the Valsalva maneuver can also be used to stop paroxysmal supraventricular tachycardia (PSVT). It has been suggested that PSVT is terminated by increasing vagal activity, which causes the atrioventricular (AV) nodal tissue to become more refractorily damaged, preventing re-entry.

##### **Diagnosis of murmur:**

It is possible to distinguish between various murmurs using the Valsalva maneuver. The move can assist in highlighting certain murmurs while lowering others because it lowers preload and, consequently, end-diastolic volume.

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