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The Connection between Yoga and Physiotherapy: A Review

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Abstract

This article discusses the connection between yoga and physiotherapy in managing various health conditions. Yoga and physiotherapy intersect in improving physical function and reducing pain by enhancing body awareness, posture, alignment, balance, strength, flexibility, and range of motion.

This article reviews the current evidence on the connection between yoga and physiotherapy, and 16 studies were included. The studies showed that yoga and physiotherapy interventions could effectively manage various health conditions, such as chronic pain, musculoskeletal conditions, and mental health issues. The studies also showed that yoga and physiotherapy interventions complement each other and can be combined to achieve better outcomes.

The connection between physiotherapy and yoga highlights the importance of an integrative approach to health and wellness, incorporating evidence-based practices from different disciplines to meet each patient's or client's needs and goals.

Keywords: Yoga, Physiotherapy, Connection

INTRODUCTION

Yoga and physiotherapy are two forms of therapy used to manage various health conditions. Yoga is a traditional Indian practice that combines physical postures, breathing exercises, and meditation. It has been shown to have beneficial effects on physical and mental health. Physiotherapy, however, involves physical modalities, such as exercise, massage, and electrical stimulation, to manage various health conditions.

Physiotherapy and yoga intersect in improving physical function and reducing pain. Both aim to enhance body awareness, posture, alignment, balance, strength, flexibility, and range of motion. They both share a holistic viewpoint that acknowledges the connection between the mind and body and the significance of treating the underlying causes of dysfunction rather than just its external symptoms.

Physiotherapy often focuses on diagnosing and treating musculoskeletal injuries and conditions, such as sprains, strains, fractures, arthritis, and back pain. It uses various techniques, such as manual therapy, exercise, electrotherapy, and education, to reduce pain, inflammation, stiffness, and muscle weakness. Physiotherapy also emphasizes functional training, which involves teaching patients how to perform activities of daily living, work, and sports safely and efficiently.

On the other hand, yoga is a mind-body practice that originated in India and encompassed a wide range of physical, mental, and spiritual practices. Its physical component, known as Hatha Yoga, consists of postures (asanas), breathing exercises (pranayama), and meditation (dhyana). Yoga postures range from gentle to challenging and can be modified for different ability levels and health conditions. The practice of yoga has been shown to improve balance, flexibility, strength, and posture, as well as reduce stress, anxiety, and depression.

The intersection between physiotherapy and yoga lies in their shared emphasis on movement, alignment, and function. Many physiotherapists incorporate yoga postures, breathing techniques, and mindfulness practices into their treatment plans to enhance the effects of conventional therapies. Similarly, many yoga teachers have a background in physiotherapy or other health professions and can offer individualized modifications and adaptations to students with injuries or limitations. Yoga therapy, a specialize form of yoga taught by trained therapists, can also be used as a complementary or alternative therapy for various health conditions, such as chronic pain, anxiety disorders, and respiratory problems.

The connection between physiotherapy and yoga highlights the importance of an integrative approach to health and wellness that combines evidence-based practices from different disciplines to meet each patient's or client's needs and goals. Working together, physiotherapists and yoga practitioners can help people achieve optimal physical function, emotional balance, and overall well-being.

Recently, interest has increased in exploring the connection between yoga and physiotherapy. Both interventions involve body movements, breathing exercises, and relaxation techniques. Yoga and physiotherapy also emphasize the importance of proper posture and body alignment to prevent injury and improve physical function. This article reviews the current evidence on the connection between yoga and physiotherapy.

METHODOLOGY:

A broad literature search was conducted on PubMed and Google Scholar databases from inception until September 2022. The following keywords were used:

“yoga," "physiotherapy," "yoga therapy," "physical therapy," "physiotherapy interventions," and "yoga interventions." Only studies investigating the connection between yoga and physiotherapy were included in this review.

RESULT:

A total of 16 studies were included in this review. The studies showed that yoga and physiotherapy interventions could effectively manage various health conditions, such as chronic pain, musculoskeletal conditions, and mental health issues. The studies also showed that yoga and physiotherapy interventions complement each other and can be combined to achieve better outcomes. For instance, a pilot study by Galantino et al. [1] showed that modified Hatha yoga could improve chronic low back pain when combined with physiotherapy.

Allie Thomas et al. [2] explored how, why, and with whom physical therapists integrate yoga into their clinical practice. Thematic analysis of 13 interviews revealed four themes: facilitating yoga in clinical practice and yoga training, perceived client outcomes, and yoga with clinical populations. Physiotherapists are using yoga to improve the physical and mental health of individuals with various health conditions. The study highlights the need for physical therapists to increase their assessment and documentation of functional outcomes associated with clients' yoga participation to contribute to evidence-based literature.

Another study by Williams et al. [3] showed that Iyengar yoga therapy could effectively manage chronic low back pain and be used as an adjunct to physiotherapy. In a systematic review and meta-analysis, Ward et al. [4] found that yoga can improve pain, functional ability, and psychosocial outcomes in musculoskeletal conditions.

Moreover, the studies also highlighted the similarities between yoga and physiotherapy interventions. For instance, both interventions involve body movements, breathing exercises, and relaxation techniques. Yoga and physiotherapy also emphasize the importance of proper posture and body alignment to prevent injury and improve physical function.

Chronic Pain:

Around the globe, millions of people experience chronic pain. It is often challenging to manage and can significantly impact a person's quality of life. Both yoga and physiotherapy interventions are effective in managing chronic pain.

A pilot study by Galantino et al. [1] investigated the effectiveness of a modified Hatha yoga program combined with physiotherapy for managing chronic low back pain. The study included 20 participants who received 12 weeks of modified Hatha yoga and physiotherapy. The results showed that combining yoga and physiotherapy effectively reduced pain, improved flexibility, and increased quality of life.

Another study by Williams et al. [3] investigated the effectiveness of Iyengar yoga therapy as an adjunct to physiotherapy for managing chronic low back pain. The study included 90 participants who received 24 weeks of either Iyengar yoga therapy or physiotherapy alone. The results showed that both interventions effectively reduced pain and improved functional ability. However, combining yoga and physiotherapy was more effective than physiotherapy alone in reducing pain and improving functional ability.

Musculoskeletal Conditions:

Musculoskeletal conditions are a group of disorders that affect the muscles, bones, and joints. They frequently need long-term management and can substantially impact a

person's quality of life. Both yoga and physiotherapy interventions are effective in managing musculoskeletal conditions.

A systematic review and meta-analysis by Ward et al.[4] investigated the effectiveness of yoga interventions for musculoskeletal conditions. The review included 17 studies examining the efficacy of yoga interventions for various musculoskeletal conditions, including osteoarthritis, rheumatoid arthritis, and fibromyalgia. The results showed that yoga interventions could improve musculoskeletal conditions' functional ability, pain, and psychosocial outcomes.

Patel Krishnakumari R et al.[5] investigated the effectiveness of an 8-week yoga asanas exercise program in patients with knee osteoarthritis compared to conventional physiotherapy interventions. This study concludes that the yoga program is more effective in improving functionality and mobility outcome measures for patients with knee osteoarthritis than conventional physiotherapy.

In a systematic review, Laidi Kan et al. [6] assessed the effects of yoga on pain, mobility, and quality of life in patients with knee osteoarthritis. Results showed that yoga might positively relieve pain and improve mobility, but the effects on quality of life are unclear.

Kolasinski et al. [7] conducted a pilot study and found that Iyengar yoga improved symptoms of knee osteoarthritis, including pain and stiffness. Moonaz et al. [8] conducted a randomized controlled trial and found that yoga improved pain, function, and mood in sedentary adults with arthritis.

In their meta-analysis, Feilong Zhu et al. reviewed 18 randomized controlled trials to evaluate the effectiveness of yoga for chronic low back pain compared with non-exercise interventions (e.g., usual care, education) and physical therapy exercise. The study concluded that yoga could be an effective therapy for chronic low back pain, particularly in the short to intermediate term, but more research is needed to determine its long-term effects and effects on quality of life.

Robert B Saper et al. [10] determined if yoga is as effective as physiotherapy for chronic low back pain. The primary outcomes were back-related function and pain measured by questionnaires, and the study found that yoga was non-inferior to PT for both outcomes but not superior to education. Secondary outcomes were similar between the yoga and PT groups.

Mental Health:

Anxiety and depression are two mental health conditions that are common worldwide. Both yoga and physiotherapy interventions are effective in managing mental health issues.

Another study examined the effects of yoga versus walking on mood, anxiety, and brain gamma-aminobutyric acid (GABA) levels in individuals with major depressive disorder. The study found that yoga and walking improved mood and reduced anxiety, but only yoga significantly increased brain GABA levels, which is associated with improved mood and decreased anxiety. [11]

Another study by M G Gabriel et al.[12] investigated the effectiveness of a Kundalini yoga intervention for managing anxiety symptoms. The study included 49 participants who received either a Kundalini yoga intervention or a stress education control intervention. The results showed that the Kundalini yoga intervention effectively reduced anxiety symptoms.

Yoga and physiotherapy share common principles, emphasizing mindfulness, body awareness, and breath control. Some yoga practices, such as pranayama (breathing exercises) and meditation, have been shown to improve respiratory function and

promote relaxation, which can help manage chronic pain and improve physical function. S Deshpande, H R Nagendra, and R Nagarathna[14] found that yoga improved self-esteem and quality of life in healthy individuals.

Christopher Joyce et al. [15] compared the effects of yoga, physical therapy (PT), and education on depressive and anxious symptoms in patients with chronic low back pain (CLBP). The results showed that yoga and PT participants experienced modest within-group improvements in depressive symptoms compared to the education group. However, the gains were not statistically significant, although trends favored yoga and PT. Anxiety symptoms were only improved in participants with mild or moderate anxiety at baseline.

Khrisha B. Alphonsus, Yingying Su, and Carl D'Arcy [16] in their systematic review and meta-analysis, examined the effect of exercise, yoga, and physiotherapy on the physical, mental, and social quality of life (QOL) among individuals living with multiple sclerosis (MS). The analysis of 18 studies showed that aerobic exercise and physiotherapy effectively improved satisfaction with physical, mental, and social functioning. However, yoga and a combination of exercises did not significantly affect any QOL domains. These findings suggest that aerobic exercise and physiotherapy may be included as standard practice in treating MS to improve QOL.

DISCUSSION:

The results of this review suggest that there is a strong connection between yoga and physiotherapy interventions. Both interventions involve body movements, breathing exercises, and relaxation techniques. Yoga and physiotherapy also emphasize the importance of proper posture and body alignment to prevent injury and improve physical function. The studies reviewed also showed that yoga and physiotherapy interventions complement each other and can be combined to achieve better outcomes.

This review also suggests that yoga and physiotherapy interventions can effectively manage various health conditions, including chronic pain, musculoskeletal conditions, and mental health issues. According to the studies we reviewed, both interventions successfully lessen pain, enhance function, and enhance the quality of life.

Overall, the evidence suggests that yoga can be an effective adjunct therapy to physiotherapy for various musculoskeletal conditions. Yoga has also been shown to have significant mental health benefits and can promote relaxation, body awareness, and mindfulness. By combining the principles and techniques of yoga and physiotherapy, healthcare practitioners can provide a holistic approach to patient care that promotes physical and emotional well-being.

Limitations:

One limitation of this review is the small number of studies included. Only sixteen studies were included in this review, limiting the findings' generalizability. Additionally, some of the studies included were small-scale pilot studies, which weakened the strength of the evidence.

CONCLUSION:

In conclusion, this review suggests a strong connection between yoga and physiotherapy interventions. Both interventions involve body movements, breathing exercises, and relaxation techniques. Yoga and physiotherapy also emphasize the importance of proper posture and body alignment to prevent injury and improve physical function. The studies reviewed showed that both interventions could effectively manage various health conditions, including chronic pain, musculo

skeletal conditions, and mental health issues. The findings of this review suggest that a combined approach to therapy that includes yoga and physiotherapy interventions may be more effective than either intervention alone.

However, further research is needed to confirm a combined approach's effectiveness and explore the potential mechanisms underlying the connection between yoga and physiotherapy interventions.

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RANDOMIZED CONTROLLED TRIAL ON THE EFFECT OF LOW-INTENSITY AEROBIC EXERCISES ON PHYSICAL ACTIVITY AND LUNG FUNCTIONS IN CHILDREN WITH DUCHENNE MUSCULAR DYSTROPHY

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Abstract

Background: Duchenne muscular dystrophy (DMD) is a genetic disorder affecting many males in India, necessitating a multidirectional management approach focused on enhancing the quality of life. Physiotherapy play crucial roles in management; however, there is a lack of recommended exercises for DMD. Therefore, this study aimed to investigate the impact of low-intensity aerobic exercises on physical activity and lung function in children with DMD.

Materials and Methods: A randomized controlled trial was conducted with 66 DMD children. The participants were divided into three groups: Group I received low-intensity aerobic exercises, Group II performed a range of motion exercises, and Group III underwent conventional exercises. All groups followed a 60-minute exercise regimen, and each child received a home program. The study spanned ten weeks.

Result: The data collected included physical activity assessments using the Physical Activity Questionnaire for Children (PAQ-C) and lung function measurements utilizing spirometry (FVC, FEV1, FEV1/VC). Assessments were conducted at baseline, after 10 weeks, and at the 20th week. Parametric tests and Kruskal-Wallis tests were employed for data analysis.

Discussion: The results demonstrated significant improvements in physical activity and lung function after the intervention. The PAQ-C analysis yielded a Kruskal-Wallis test statistic 39.65 ($p < 0.001$), indicating significant differences among the groups. Repeated measures ANOVA analysis showed significant improvements in FEV1, FVC, and FEV1/FVC with F values of 252.945, 31.43, and 78.35, respectively.

Conclusion: Compared to the range of motion and conventional exercises, low-intensity aerobic exercises yielded superior results. Therefore, incorporating low-intensity aerobic exercises into managing Duchenne muscular dystrophy could be beneficial.

Keywords: Duchenne muscular dystrophy, Low intensity aerobic exercsies, Range of motion exercises, Physical training in children, Lung funcitons.

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Introduction

Duchenne Muscular Dystrophy (DMD) is a genetic disorder that predominantly affects children. DMD is characterized by gradual muscle weakness and degeneration due to a mutation in a protein called dystrophin, vital in developing healthy muscle cells. It is the most common and debilitating disease, with a prevalence of 15.9 to 19.5 new borns per 100,000 (Jean, 2014). Fairclough (2011) reported that the dystrophin gene mutation leads to the deficiency of the dystrophin protein, causing an X-linked recessive illness that affects one in every 3500 children. DMD is a rare inherited muscle disorder that weakens skeletal muscles (Emery, 2002).

The absence of dystrophin protein is observed in most DMD patients. Dystrophin, which plays a crucial role in muscle as a connection between the extracellular matrix and the internal cytoskeleton, becomes unstable without dystrophin, reducing member protein levels (Straub, 1997). This instability causes membrane leakage and gradual fibre degradation. The loss of DAPC's signalling function also results in altered pathology in muscle (Blake et al., 2002). Goldstein (2010) found that the absence of dystrophin makes the plasma membrane more friable, slightly rigid, and leaky, which exposes dystrophin-deficient muscle to hypoosmotic conditions and leads to membrane blebbing.

In skeletal muscle, fibrosis is most commonly associated with muscular dystrophies, a clinically and molecularly heterogeneous group of diseases. The loss of myofibers is typically caused by necrotic cell death, coupled with fibrosis that gradually replaces myofibers. However, the mechanisms for repairing membranes may be active, and restored muscle fibres may display a dysfunctional intracellular membrane. The extracellular matrix's remodelling of surviving muscle fibres also damages muscle function (Petrof, 1993).

Currently, there are no specific treatments for DMD, and the only aim is to address problems and symptoms (Birnkrant, 2018). However, several drugs have been utilized to treat DMD and prevent further deterioration. Additionally, gene and steroid therapy has been discovered as treatments that help control dystrophin protein levels and restore muscle function (Bushby, 2009).

Physiotherapy plays a crucial role in DMD, preventing musculoskeletal issues and maintaining muscle contractility, improving joint mobility, maintaining symmetry, and preventing or minimizing contractures and deformities at all stages (Bushby, 2010; Birkrant, 2018). However, the effect of exercise on DMD remains questionable (Ansved, 2001; Lindeman, 1999), especially since muscles are weaker in DMD. Aerobic exercises are recommended to improve cardiovascular fitness and muscular endurance (Punia, 2016). These exercises use significant muscle groups and improve oxygen consumption in the body. They may be low-intensity and use carbohydrates as an energy source, which are converted to energy using ATP at the mitochondria. Mitochondria generally rely on oxygen to metabolize carbs, proteins, and fats (McArdle, 2006). Meta-analyses show that aerobic exercises significantly change muscle strength, improve fitness, and enhance the quality of life (Reiner, 2013; Ueshima, 2010).

Since no studies compare aerobic exercises to DMD, studies on aerobics are done extensively for the older population and cancer patients. Since the effect of the treatment remains the same, this study tries

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to identify the role of aerobics in DMD children. So, the study aims to identify the effect of low-intensity aerobic exercises on lung functions and physical activity in children with DMD.

Materials and Methods

The study is a randomized trial with three active treatment groups, conducted at the Institute of Muscular Dystrophy and Research Center, Jeevan Foundation, Veeravanalur, Tirunelveli District, Tamil Nadu, India. The participants were selected from a cluster of children and randomly allocated into the three groups with equal numbers. The sampling method used was systematic sampling. The study aimed to evaluate the effectiveness of different therapies on boys aged 6 to 13 years diagnosed with Duchenne muscular dystrophy (DMD) based on DNA study.

The inclusion criteria included boys in the ambulation phase who could perform daily activities with minimal support and took less than five seconds to get up from the floor. The sample size of 66 children was determined based on a previous study by Alemdaroğlu et al. (2015) using a 95% confidence interval. However, specific details regarding the sample size calculation method used in the previous study.

The study employed single-blinding, where the researcher had knowledge of the therapy, but the participants remained blinded. The participants were thoroughly assessed, and those meeting the selection criteria were included in the study. The random allocation into the three treatment groups was done using computer-assisted evaluation. Before beginning the trial, parents/guardians provided written consent, and the children were randomly assigned into three groups. Group I consisted of twenty-two children who underwent low-intensity aerobic exercises for sixty minutes with frequent rest periods. Group II consisted of twenty-two children who underwent range of motion exercises for sixty minutes with frequent rest periods. Group III consisted of twenty-two children who underwent conventional physiotherapy for sixty minutes with frequent rest periods. All the groups underwent 30 minutes of regular physiotherapy. The study was conducted for 20 weeks on alternate days, and a separate physiotherapist was deputed to conduct the study for the three groups.

All the treatment programmes are provided without disturbing their regular school schedules. The home programme is also taught to the children, parents or guardians, and the therapist monitors them frequently through video or telephone. Every child will take the exercise programme for six months, 20 weeks. Those who completed the 20-week schedule were taken for the final analysis, and the blinded researcher collected their data.

Group I received, Walking and cycling are done for 30 minutes on alternative days. With this, exercises for the upper and lower limbs are given. This exercise programme was applied for two to three sets of 5—10 repetitions which includes leg press, Hip forward flexion, hip forward and backward movements, hip sideward movements, hip rotations, knee curls, ankle movements, ankle circles, toe curls for the lower limbs and bench press, shoulder movements in all directions, diagonal movements of the shoulder, elbow bending, wrist circles, finger curls and thumb movements for upper limbs. Repetitive breaks were given during these exercises to prevent fatigue. Participants exercised 3 days a week for the first 3 weeks, 4 days a week for the next 5 weeks,

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and 5 days a week afterwards. The children's exercise program lasts 60 minutes (Cup, 2007; MacInnis, 2017).

Group II receives an active range of motion exercises that should be performed on every joint. All the joints should be moved for ten counts and repeated twice daily—active or active assisted range of motion exercises to be imparted to each joint. Forearm supination, pronation, shoulder flexion, extension, abduction, and adduction are all subjected to active range of motion exercises. Finger forward bending, abduction, adduction, and extension; flexing the wrist, extension, and rotations. Alternatively, bending forward of the hips, backwards swinging, inwards and outward movements, knee bending, ankle forward and backward motions, subtalar inversion and eversion, and toe flexion and extensions are all movements of the lower extremity. In the spine, cervical flexion, extension, lateral flexion and rotations, and lumbar spine flexion and extension (Vignos et al., 1996).

Group III receives, conventional physiotherapy which included range of motion exercises, stretching exercises and postural correction exercises. All the joints should be moved for ten counts and repeated twice daily—active or active assisted range of motion exercises to be imparted to each joint. Stretching needs to hold for 15 seconds three time (Mayhew et al., 2013).

All the participants underwent a respiratory exercise. These exercises were given to all the participants. The parents were also taught about the technique and advised to monitor the children when they do the exercises. Respiratory exercises have started with deep breathing exercises (Ma et al., 2017).

The outcome measures for the study were lung functions, measured using a spirometer, and physical activity, measured using the Physical Activity Questionnaire for Children (PAQ-C). The data were collected at regular intervals and were taken for analysis. Day 1 data was considered the pre-test, the 10th-week data was the post-test I, and the 20th-week data was the post-test II. SPSS 22.0 was used to analyze the collected data.

Results

Table I Descriptive data

Shapiro-Wilk test			
	Statistic	df	Sig.
FEV1.PRE TEST	0.911	48	0.001
FVC.PRE TEST	0.944	48	0.023
FEV1/VC.PRE TEST	0.901	48	0.001

Table I shows the demographic analysis of the participants in all the groups. This table shows that the participants average age is 6.45 years, this study includes first child and second child as well.

Table II Test of Normality

Shapiro-Wilk test			
	Statistic	df	Sig.
FEV1.PRE TEST	0.911	48	0.001
FVC.PRE TEST	0.944	48	0.023
FEV1/VC.PRE TEST	0.901	48	0.001

Table II shows the test of Normality using Shapiro-Wilk test, it shows that there is no significance difference in between the pre test groups prior to the start of the treatment.

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Table III: Non-Parametric Analysis for PAQ-C using Friedman's Two-way analysis

	LIAE Group	ROM Group	Conventional Group
Total N	22	22	22
Test Statistic	28.795	0.2727	0.0682
Degree of Freedom	2	2	2
Asymptotic Sig. (2-sided test)	0.0001*	0.872	0.9965

*Denotes statistically significance

Table III shows the non-parametric analysis for the PAQ-C scale using Friedman's two-way analysis of variance by ranks between the pre-test, post-test I, and post-test II. This table shows that the ROM and Conventional groups don't provide significant results between the test values. Further, the post hoc test was conducted to identify the group differences.

Table IV: Repeated measures ANOVA for FEV_1—Within group

Groups	Pretest Mean ± S.D	Post-test I Mean ± S.D	Post-test II Mean ± S.D	F value	p value
LIAE	27.32 ± 9.97	35.95 ± 9.22	41.18 ± 8.36	264.59	0.0001*
ROM	27.18 ± 9.45	27.32 ± 9.70	27.36 ± 9.80	2.294	0.1134**
Conventional	27.09 ± 9.49	27.14 ± 9.52	27.23 ± 9.95	2.49	0.0949**

* Statistically significant @ 0.05% level ** Statistically not significant @ 0.05% level

Table V: Repeated measures ANOVA for FVC—Within groups

Groups	Pretest Mean ± S.D	Post-test I Mean ± S.D	Post-test II Mean ± S.D	F value	p value
LIAE	32.32 ± 6.97	35.31 ± 8.62	37.32 ± 12.56	38.076	0.0001*
ROM	32.33 ± 5.83	32.40 ± 5.93	32.42 ± 6.05	2.814	0.0713**
Conventional	32.27 ± 6.64	32.30 ± 6.73	32.32 ± 6.83	2.594	0.0866**

* Statistically significant @ 0.05% level ** Statistically not significant @ 0.05% level

Table VI: Repeated measures ANOVA for FEV_1/ FVC—Within groups

Groups	Pretest Mean ± S.D	Post-test I Mean ± S.D	Post-test II Mean ± S.D	F value	p value
LIAE	44.41 ± 4.61	45.05 ± 3.99	48.64 ± 4.83	85.577	0.001*
ROM	44.45 ± 4.92	44.50 ± 4.90	44.59 ± 4.58	2.492	0.0949**
Conventional	44.36 ± 5.11	44.41 ± 5.30	44.45 ± 5.30	1.537	0.227**

* Statistically significant @ 0.05% level ** Statistically not significant @ 0.05% level

Tables IV, V and VI show the within-group analysis using the repeated measures ANOVA. The LIAE group shows significance in all the values (FEV1, FVC & Fev1/FVC), whereas the other groups don't produce a significant result. Further, the post hoc test was conducted to identify the group difference

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Table VII: Non-Parametric Analysis for PAQ-C using Kruskal-Wallis Test

	Post-test I	**Post-test II**
Total N	22	22
Test Statistic	23.988	39.695
Degree of Freedom	2	2
Asymptotic Sig. (2-sided test)	0.0001*	0.0001*

*Denotes statistically significance

Table VII shows the Kruskal-Wallis analysis for the PAQ-C to compare the Posttest I & Posttest II values between all the groups. The calculated test statistics show marked significance at 0.001. Further, this implies that the LIAE group significantly improves PAQ-C than the other two groups.

Table VIII: Repeated measures ANOVA for FEV_1—Between groups

Groups	**Outcomes**	**LIAE**	**ROM**	**Conventional**	**F value**	**p value**
Post-test I Mean ± S.D	**FEV_1**	45.05 ± 3.99	44.50 ± 4.90	44.41 ± 5.30	98.236	0.001*
Post-test II Mean ± S.D		48.64 ± 4.83	44.59 ± 4.58	44.45 ± 5.30	252.945	0.001*
Post-test I Mean ± S.D	**FVC**	35.31 ± 8.62	32.40 ± 5.93	32.30 ± 6.73	14.41	0.001*
Post-test II Mean ± S.D		37.32 ± 12.56	32.42 ± 6.05	32.32 ± 6.83	31.43	0.001*
Post-test I Mean ± S.D	**FEV_1 / FVC**	45.05 ± 3.99	44.50 ± 4.90	44.41 ± 5.30	3.967	0.001*
Post-test II Mean ± S.D		48.64 ± 4.83	44.59 ± 4.58	44.45 ± 5.30	78.35	0.001*

*Statistically significant @ 0.05% level

Table VIII shows the between-group analysis using repeated measures ANOVA. It was inferred from the table that marked significant differences exist among the groups on the post-test I value and post-test II values. The LIAE group shows significance in all the values (FEV1, FVC & Fev1/FVC), whereas the other groups don't produce a significant result.

Discussion

Muscle diseases, such as Duchenne muscular dystrophy (DMD), are inherited disorders caused by gene mutations (Mercuri & Muntoni, 2013). Unfortunately, there is currently no cure for DMD, and the best available treatment options aim to extend the lifespan of affected children (Arora, 2019). However, low-intensity aerobic exercise has been found to offer numerous benefits to individuals with various disorders, including those with DMD.

One of the main advantages of low-intensity aerobic exercise is that it improves health-related quality of life (HRQOL). When individuals engage in low-intensity aerobic exercise, oxygen flow to their muscles increases, allowing physiological processes to continue without undue fatigue.

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(Shahana et al., 2010). This increase in blood flow also promotes the formation of additional blood vessels, allowing for even greater oxygen delivery to the muscles during exercise Aerobic exercise can also cause physical adaptations in the muscles. For example, it can alter the cross-sectional area of slow-twitch muscle fibers, leading to increased muscular endurance (Abernethy et al., 1990). In addition, Terjung (1995) found that aerobic exercise can positively impact bone mass and minerals. Exercise can also help mobilize fat and enhance the body's ability to oxidize fat using muscle enzymes (Wilmore and Costill , 2005).

Research has also shown that low-intensity aerobic exercise can significantly improve body composition, cardiovascular function, and muscular endurance. For example, a study by Mahendran et al. (2009) found that 12 weeks of aerobic exercise improved body composition, cardiovascular function, and muscular endurance. Similarly, a study by Esleman et al. (2022) found that 12 weeks of aerobic training significantly improved cardiovascular fitness and body composition in school students.

Low-intensity aerobic exercise is any physical activity that increases heart rate and respiratory volume to meet the oxygen demand of the muscles during contraction (Wu et al., 2020). Because it strengthens respiratory muscles like the the diaphragm and intercostals, low-intensity aerobic exercise can also enlarge the chest and improve lung capacity (Bassi et al., 2015). In addition, this type of exercise can increase VO2 max and help activate previously inactive alveoli, improving overall lung function (Park et al., 2017).

Finally, research has shown that low-intensity aerobic exercise can help improve various lung function parameters in children with DMD. For example, Lee (2016) found that repeated inspiratory and expiratory stimulation during exercise increased alveolar compliance, improving forced vital capacity (FVC). Similarly, studies by Song et al. (2016) and Rawashdeh (2018) showed that exercise helped restore respiratory and trunk muscles, improving FEV1/FVC.

Overall, the benefits of low-intensity aerobic exercise on physical activity and lung function in children with DMD are clear. A recent study found a strong positive relationship between low-intensity aerobic exercise, physical activity, and lung function parameters in children. The low-intensity aerobic exercise group showed significant improvement in all parameters compared to the other groups. Based on the statistical analysis and previous research, it is clear that low-intensity aerobic exercise can significantly improve physical activity and lung function in children with DMD.

Conclusion

Based on the study's findings, it can be concluded that low-intensity aerobic exercises are the most effective intervention for improving lung function and physical activity in children with Duchenne muscular dystrophy. At the same time, conventional and range-of-motion exercises were less effective than low-intensity aerobic exercises. Therefore, healthcare professionals and caregivers should consider incorporating low-intensity aerobic training into the treatment plans for children with Duchenne muscular dystrophy to improve their overall physical health and well-being. These findings highlight the importance of incorporating low-intensity aerobic exercises into the treatment and management plans for individuals with this condition. Further research and exploration could provide additional insights and optimize exercise interventions for better outcomes in Duchenne muscular dystrophy patients.

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The Concept and Challenges of Life Style Diseases: A Short Review

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Abstract

Lifestyle diseases, or non-communicable diseases (NCDs), are caused by unhealthy lifestyle choices and environmental factors. These chronic diseases include cardiovascular disease, type-2 diabetes, and cancer, which are responsible for 71% of global deaths, according to the World Health Organization. Poor diet, lack of physical activity, tobacco, alcohol use, and stress are common causes and risk factors for lifestyle diseases. Lifestyle diseases significantly impact individualsand society, including physical and emotional burdens and economic burdens. Policymakers can play a role in addressing lifestyle diseases by implementing policies and regulations to prevent and manage these conditions, such as a sugar tax or restrictions on tobacco and alcohol use.

Keywords: Lifestyle diseases, non-communicable diseases

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INTRODUCTION

Lifestyle diseases, or non-communicable diseases (NCDs), are health conditions caused by unhealthy lifestyle choices and environmental factors. [1] These chronic diseases often develop slowly over time, with symptoms often not appearing until later stages. Examples of lifestyle diseases include cardiovascular disease, type-2 diabetes, and cancer. [2]

The discussion of lifestyle diseases is crucial because they are a worldwide public health issue. According to the World Health Organization (WHO)[3], NCDs are responsible for 71% of global deaths, with approximately 15 million people dying prematurely from these diseases each year. Additionally, lifestyle diseases are preventable, and many can be managed through lifestyle interventions and medical treatment. By understanding the causes and risk factors of lifestyle diseases and prevention and management strategies, individuals can take proactive steps to protect their health and well-being. Policymakers can also use this information to develop effective policies and regulations to reduce the burden of lifestyle diseases on society.

TYPES

Lifestyle diseases are a group of chronic conditions largely preventable and linked to unhealthy lifestyle choices. Here are some common examples of lifestyle diseases:

Cardiovascular disease (CVD):
This includes heart disease, stroke, and other conditions that affect the heart and blood vessels. A combination of factors such as high blood pressure, high cholesterol, smoking, physical inactivity, and poor diet often causes CVD.

Type 2 diabetes: This condition affects how the body processes blood sugar (glucose). It is linked to obesity, lack of physical activity, and poor diet.

Cancer:
Certain types of cancer, such as breast, colon, and lung cancer, have been linked to lifestyle factors like tobacco and alcohol use, poor diet, and physical inactivity.

CAUSES

The causes and risk factors of lifestyle diseases are multifactorial, but some of the most common factors include the following:

Poor diet: A diet high in processed foods, unhealthy fats, salt, and sugar canincrease the risk of developing lifestyle diseases.

physical Inactivity: Sedentary lifestyles can increase the risk of obesity, diabetes, and other lifestyle diseases.

Tobacco and alcohol use: Tobacco and excessive alcohol consumption are major risk factors for many lifestyle diseases, including CVD and cancer.

Stress: Chronic stress can negatively affect the body, increasing the risk of heart disease and other lifestyle diseases.

Understanding these causes and risk factors is essential for preventing and managing lifestyle diseases. By making positive lifestyle choices such as eating a healthy diet, engaging in regular physical activity, avoiding tobacco and excessive alcohol use, and managing stress levels, individuals can reduce their risk of developing lifestyle diseases.

PREVENTION AND MANAGEMENT

Preventing and managing lifestyle diseases involves a combination of lifestyle interventions and medical treatment. Here are some examples of each:

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(a) Lifestyle interventions: These are changes in behavior and habits that can helpprevent and manage lifestyle diseases. They include:

Healthy eating: A diet rich in fruits, vegetables, whole grains, lean proteins,and healthy fats can help reduce the risk of lifestyle diseases.

Physical activity: Regular exercise can help improve cardiovascular health, maintain a healthy weight, and reduce the risk of many lifestyle diseases.

Stress reduction: Managing stress through techniques such as mindfulness,yoga, and meditation can help reduce the risk of lifestyle diseases.

(b)Medical interventions: These are treatments healthcare professionals provideto help manage lifestyle diseases. They include:

Medication: Certain medications can help control blood pressure, cholesterol levels, and blood sugar in individuals with lifestyle diseases.

Surgery: In some cases, surgery may be necessary to manage lifestylediseases such as CVD or cancer.

It is important to note that lifestyle interventions are often the first line of defense against lifestyle diseases, and in some cases, they can be just as effective as medication or surgery. Individuals should work with their healthcare professionals to determine the best approach for preventing and managing their lifestyle disease based on their circumstances.

IMPACT OF LIFESTYLE DISEASES

Lifestyle diseases have a significant impact on both individuals and society as a whole. Here are some examples:

(a) Physical and emotional burden on individuals: Lifestyle diseases can cause a significant physical and emotional burden on individuals, including:

Reduced quality of life: Lifestyle diseases can cause chronic pain, disability, and other health problems that significantly reduce an individual'squality of life.

Emotional distress: The burden of lifestyle diseases can also cause emotional pain, including depression, anxiety, and social isolation.

Increased risk of premature death: Lifestyle diseases can increase the riskof early death, significantly impacting individuals and their families.

(b)The economic burden on society: Lifestyle diseases also have a significant economic impact on society, including:

Healthcare costs: Lifestyle diseases account for a large portion of healthcare spending in many countries. This includes the cost of these conditions' diagnosis, treatment, and ongoing management.

Lost productivity: Lifestyle diseases can also lead to lost productivity due to missed work days, reduced work capacity, and early retirement.

Economic inequality: Lifestyle diseases disproportionately affect lower- income individuals and communities, leading to economic and social disparities.

Addressing the economic burden of lifestyle diseases requires a coordinated effort from policymakers, healthcare professionals, and the broader community. [4] This includes implementing effective prevention and management strategies, promoting healthy lifestyle choices, and addressing social and economic factors contributing to developing lifestyle diseases. [5]

ADDRESSING LIFESTYLE DISEASES AT THE POLICY LEVEL

Addressing lifestyle diseases at the policy level involves implementing policies and

regulations to prevent and manage these conditions. Here are some examples:

Sugar tax: A sugar tax is a policy that taxes sugary drinks and other high- sugar products to discourage their consumption. This policy aims to reduce the consumption of sugary drinks, which are linked to the development of conditions such as obesity, type-2 diabetes, and CVD.

Smoking bans: Smoking bans are policies that prohibit smoking in public places and workplaces. These policies aim to reduce exposure to secondhandsmoke, which is linked to the development of lung cancer, CVD, and other health problems.

While policies and regulations can effectively prevent and manage lifestyle diseases, there are challenges and limitations to addressing these conditions at the policy level. Some of these challenges include:

Resistance from industries: Industries that produce and market unhealthy products may resist policies aimed at reducing consumption of these products, as they may negatively impact their profits.

Public perception: Some individuals may perceive policies to reduce lifestyle diseases as intrusive or unnecessary and resist them.

Implementation challenges: Despite these challenges, addressing lifestyle diseases at the policy level is an essential strategy for reducing the burden of these conditions on individuals and society. Policymakers can play a critical role in preventing and managing lifestyle diseases by implementing policies and regulations that promote healthy lifestyle choices and reduce exposure to unhealthy products and behaviors. [6]

CONCLUSION

Lifestyle diseases are a significant public health challenge, with poor diet, lack of physical activity, tobacco and alcohol use, and stress being major risk factors for their development.

To address lifestyle diseases, individuals must take responsibility for their health by making healthy choices, such as engaging in regular physical activity, eating a balanced diet, avoiding tobacco and excessive alcohol use, and managing stress. Atthe same time, policymakers are critical in implementing policies and regulations to reduce exposure to unhealthy products and behaviors, promote healthy lifestyle choices, and address social and economic factors contributing to developing lifestyle diseases.

In conclusion, lifestyle diseases are preventable and manageable through individual and collective action. By working together, we can reduce the burden of lifestyle diseases on individuals, families, and society and improve overall health and well-being. Our collective responsibility is to take action and address the growing epidemic of lifestyle diseases.

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Correlation of sleep quality and concentration among physiotherapy students

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Abstract

Background: Sleep is an important part of human health and life and is necessary for the maintenance of good health. With so many distractions in their life, college students are known for their variable sleep schedules. Sleep deprivation can affect the concentration and educational status of students. It affects the capacity of individual learning and academic performance. Inadequate sleep may affect cognitive function. The aim of the study was to find correlation between sleep quality and concentration in physiotherapy students.
Methods: An observational-analytical study was conducted on physiotherapy students willing to participate, using convenience sampling technique. Data was collected through Google forms which included demographic data, the Pittsburg sleep quality index (PSQI) to assess sleep quality and concentration questionnaire to assess concentration levels.
Results: 55 physiotherapy students completed the forms; there were 12 males and 43 females with mean age (20.0±0) years. Mean score for PSQI (7.00±7.10) and for concentration questionnaire (9.50±3.50). Spearman's correlation to find correlation between PSQI and concentration questionnaire showed (r=0.352, p=0.008)
Conclusion: Sleep Quality and concentration are found to be affected with a weak positive correlation seen between sleep quality and concentration in physiotherapy students.
Keywords: concentration, physiotherapy students, PSQI, sleep quality

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INTRODUCTION:

Sleep is a physiological process which is a crucial part of human life. Sleep and related problems are affected by physical, emotional, mental, and environmental factors such as age, gender, work, lifestyle, stress, and noise. Adults need an average of seven to nine hours of sleep a night. [9] The situation or condition of suffering from a lack of sleep is called sleep deprivation. Sleep deprivation has many harmful effects on human biology and is associated with fatigue, sleepiness during daytime, impaired motor skills, reduced endurance, stress, depression, anxiety, and decrease neurocognitive performance. [1]

Everyone's sleep cycle is different depending on what activities they did during the day. So there are different sleep cycles from children to adults. Meanwhile, in the morning teenagers have to get up early to get ready for college or work. In general, adolescents experience sleep deprivation so it is not surprising that many students or students fall asleep when class starts.[12] Cognitive performance in students, including concentration and predictability of completing tasks, is adversely affected by sleep deprivation. Memory and concentration problems are the first to be affected.[1] Previous studies have shown that the quantity of sleep reported by individuals as late or inappropriate sleep, especially late waking on weekends, and daytime sleepiness is associated with compromised academic performance in children and adults. [8]

Physiotherapy students face a lot of stress while completing their education and this stress affects their sleep quality. Students find it difficult to cope with the stress of academic life. Lack of sleep can affect short-term memory, attention power, ability to work, circadian rhythms, and mental health making it difficult to remember and hard to concentrate, and react quickly.[4] So the aim of the study was to find the quality of sleep and concentration levels in physiotherapy students and correlation between sleep quality and concentration in physiotherapy students of Ahmedabad.

METHODOLOGY:

An observational- analytical study was conducted on 55 physiotherapy students in Ahmedabad. Physiotherapy students aged 18-25 years, studying in any year, and who were voluntarily ready to participate in the study were included. Data was collected through Google forms using convenience sampling technique.

Sleep quality of students was assessed through the Pittsburg sleep quality index (PSQI) and concentration level was assessed through Concentration Questionnaire. PSQI is a self-administered questionnaire Students limit their responses to incidents that occurred during the past month. It includes seven domains. In scoring the PSQI each question is scored 0 (no difficulty) to 3 (severe difficulty). The component scores are added up to produce a global score (range 0 to 21). This means that a score of 0 means good sleep quality and a global score of 5 means bad sleep quality for that person, the higher the global score obtained, the worse the sleep quality of a person. Higher scores indicate worse sleep quality for PSQI.[2] In the Concentration questionnaire, there are 20 questions, 1 point for each YES answer. A low score (approximately 0-6) means good concentration strategies. A high score (approximately 14-20) means one needs to improve concentration skills. [3]

Data analysis was done using SPSS20. The level of significance was kept at 5%

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RESULTS:

Total 55 physiotherapy students completed the Google forms of which there were 12 males and 43 females with mean age (of 20.0±0) years.

Table 1 shows the mean scores for PSQI and Concentration Questionnaire.

Outcome measures	Mean± SD
PSQI	7.00±7.10
Concentration questionnaire	9.50±3.50

More than 30% of students went to bed between 11:00 pm to 12:00 pm and more than 45% of students got up between 7:30 am to 8:00 am. More than 50% of participants answered that they cannot get to sleep within 30 minutes once or twice or more times a week. 30% of participants gave an answer that they wake up in the middle of the night or early morning once or twice or more times in last week. 30% had bad dreams in last week. 10% answered during last month, they rate their sleep quality as fair or very bad.

While answering the concentration questionnaire more than 50-55% felt they got easily distracted by background noise, daydreaming during lectures, easily distracted by visual stimulation, not able to keep their mind focused on studying, trouble getting back to work after they have any interruptions. 80% felt that they were easily distracted by internal thoughts or feelings. 30% of students find it difficult to concentrate for more than 15 minutes.

Data was not normally distributed so Spearman's correlation was used to find correlation between sleep (PSQI) and concentration (concentration questionnaire). Spearman's correlation analysis showed a statistically significant weak positive correlation between sleep quality and concentration (r=0.352), (p=0.008).

DISCUSSION:

In the study, mean score for PSQI was (7.00±7.10) and for concentration questionnaire (9.50±3.50). PSQI score <5 means favorable sleep quality[11] Here mean score 7.00 means sleep quality isslightly affected. A middle-range score for concentration questionnaire (approximately 7-13) means concentration is affected and the students are already using some good concentration strategies but they will likely benefit from learning more about how to improve their concentration abilities.

In the present study correlation analysis suggests weak positive correlation between sleep and concentration in physiotherapy students which is statistically significant. According to the results of Feriani's research about the relationship between sleep quality and learning concentration, showed that 14 (78%) students had good study concentration and good sleep quality, 4 (22%) students had good sleep and poor study concentration. On the other hand 7 (33%) students had good study concentration and poor sleep quality and students with poor sleep quality and poor study concentration were 14 (67%). The Chi-square test was significant, which means that there is a relationship between sleep quality and children's learning concentration. An OR of 7,000 indicates that students who sleep poorly are at 7,000 time's greater risk of concentrating on learning less. [7] Nariya D et al studied the factors associated with sleep quality in

undergraduate physiotherapy students. The aim of this study was to determine the effect of various factors like obesity; stress, anxiety, physical activity, and electronic gadgets use time duration on quality of sleep among undergraduate physiotherapy students. They found that sleep quality among physiotherapy students is notably associated with a variety of psychological factors including stress and anxiety. Meanwhile, sleep quality has a minimal association with depression, physical activity and use of electronic devices.[10]

Similar to our study, another study was conducted by Sami Fawzy et al to see the effect of sleep quality on educational performance of paramedic students of Kingdom of Saudi Arabia. They found that sleep quality of paramedic students is affected with high ration by the educational performance. This is because the high stress of work regarding paramedic students leads them to have less amount of sleep [6] Douris PC et al did a study which aimed to investigate the correlation between academic performance and changes in predictor variables of aerobic fitness, sleep, stress and quality of life (QOL) in students studying in the first year of a physical therapist education program. They concluded that achieving academic success can be affected by changes in sleep and QOL. [5]

The limitation of our study was that factors affecting sleep and physical activity levels were not checked.

CONCLUSION:

Sleep Quality and concentration are found to be affected with a weak positive correlation seen between sleep quality and concentration in physiotherapy students. Thus, among physiotherapy students, it can be said that sleep may affect student's academic performance. Studies to improve awareness and knowledge about sleep hygiene for better academic performance and better physical and mental health can be conducted**.**

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A NARRATIVE REVIEW ON THE EFFECT OF DIAPHRAGMATIC BREATHING EXERCISE ON PULMONARY FUNCTION IN SMOKERS

Dharmesh Mori[1*], Dr. Anjali Suresh[1], Dr. Sedhunivas[2]

Abstract

Background: Determining if diaphragmatic breathing exercises enhance pulmonary function in smokers was the goal of this narrative review. Further research is necessary, though, to fully understand how diaphragmatic breathing affects a smoker's lungs.

Methods: To find the most recent data on the impact of diaphragmatic breathing exercises on smokers' pulmonary functioning, the author searched PubMed and Google Scholar.

Results: The original articles included in this review were randomly selected from systematic reviews. In patients with chronic obstructive pulmonary disease (COPD), diaphragmatic breathing appears to be helpful, suggesting roving exercise capacity and respiratory performance.

Conclusions: This narrative review found that the poor quality of research made it difficult to determine exactly how effective diaphragmatic breathing is in clinical use. However, it might be a doable and useful therapeutic strategy for various disorders.

Keywords: Diaphragmatic Breathing, Lung Function Capacity, Smokers

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INTRODUCTION

Smoking can impair pulmonary functioning and cause oxygen deficiency in cells due to increased blood levels of carbon monoxide and decreased oxygen-carrying capacity of hemoglobin. Smoking can also impair physical fitness and exercise capacity [1] Smoking is regarded as one of the leading causes of death because just one cigarette can reduce life expectancy by 11 minutes. [2,3] Ninety percent of smokers start before they turn 25.4 Smoking has become more prevalent among young people, which leads to early pulmonary function issues [5,6]

Smokers need to keep the muscles involved in breathing in sync to increase their air intake. These muscles stimulate rib expansion and diaphragm descent during inspiration, boosting air influx into the lungs. During expiration, these muscles relax, allowing air to escape the lungs.

Dyspnoea can be brought on by weak breathing muscles, which also makes it harder to exercise. Therefore, treatment measures are required to augment respiratory muscle functioning and improve breathing and exercise capacity. [8,9] Smoking is fatal to health since it contains toxic compounds that provide the groundwork for numerous fatal conditions like asthma, COPD, bronchitis, and cardiovascular disorders, among others.[10]

Pulmonary functions are gradually harmed by cigarette smoking. As a result, roughly 15-20% of smokers have chronic obstructive lung problems, 50% have chronic bronchitis symptoms, and only 30% are healthy smokers.[11] Since diaphragmatic breathing allows for a proper exchange of oxygen and carbon dioxide, it is a useful technique for breathing and relaxing the lungs. It is reportedly useful in alleviating back pain,[14] spine correction,[15] abdominal strengthening,[16] improving breathing efficiency, dyspnoea, and activity capacity,[13] reducing metabolic acidosis, and improving body composition and flexibility.[17]

Diaphragmatic breathing, also known as belly breathing, is a slow, deep breathing technique that should not be viewed as only a breathing control.[18] Diaphragmatic breathing is described as taking slow, deep breaths through the nostrils while moving the chest as little as possible when reclining and with one hand on the chest and the other on the belly[19] Yoga practitioners and practitioners of traditional martial arts like tai chi use diaphragmatic breathing as a vital technique during meditation sessions. A recent comprehensive review found that yoga and tai chi help lower stress in people who are experiencing high levels of stress or negative emotions by altering the sympathetic-vagal balance.[20]

Even though breathing exercises are effective in treating conditions like chronic obstructive pulmonary disease (COPD)[21,22] asthma,[23,24] postoperative pulmonary function,[25,26] and cardiorespiratory function in Fontan patients,[27] more research is still needed to determine how diaphragmatic breathing affects conditions like cancer, heart failure, and anxiety. Since there hasn't been much research on how diaphragmatic breathing exercises affect smokers' capacity to breathe deeply, this narrative review is important.

LITERATURE SEARCH METHODOLOGY

Google Scholar and PubMed are the two online search engines used to gather journals. Based on the keywords, the authors located the articles.

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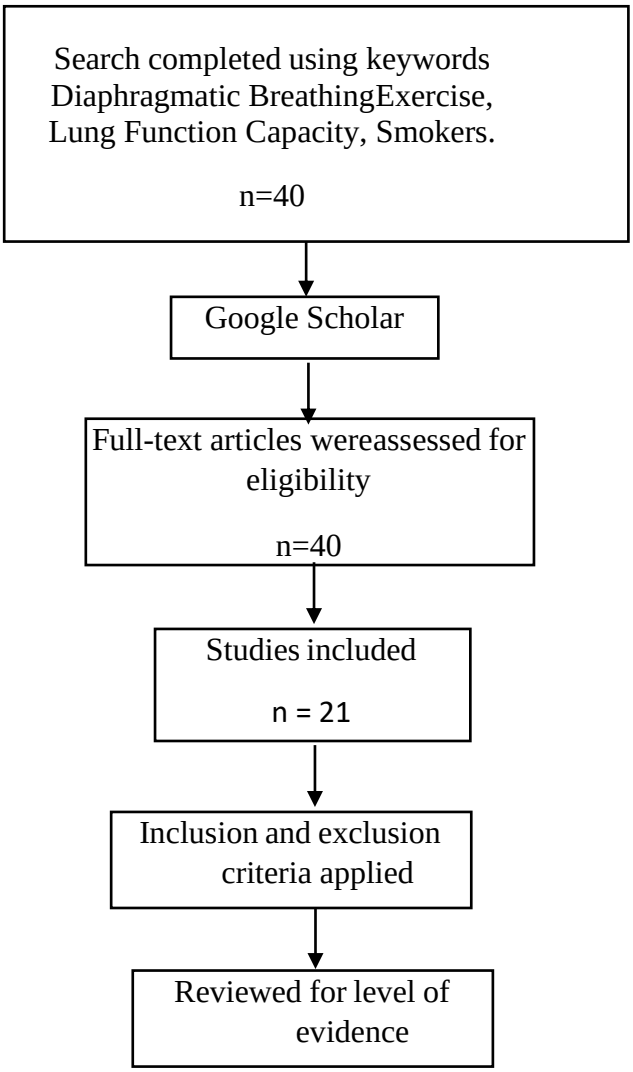
The complete texts of the articles were gathered. A total of 40 articles were found, and 21 were chosen for examination. [Fig-1]



STUDY SELECTION

Inclusion criteria: (1) Articles published in English language only; (2) Diaphragmatic breathing: smokers only; (3) Articles from 2005-2022 have been taken.

Exclusion criteria: (1) Articles published in other languages; (2) Articles published below the year 2004.

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Sr. No.	Author	Title	Year	Study Design	Conclusion
1	Dr. Vaidik P.Rupareliya etal [28]	Immediate effects of slow pranayama on cardiorespiratory parameters in young adult tobaccosmokers	2022	Original Article	The study can conclude thatslow pranayama shows statistically significant improvement in Respiratory rate and SPO2
2	Ali Albarratiet al [29]	The immediate effect of thoracolumbar manipulation and diaphragmatic release on inspiratory muscle strength in healthy smokers	2022	Original Article	The diaphragmatic release technique and thoracolumbar manipulation increased the diaphragm strength in healthy adult smokers, suggesting its potential utilityin the management of participants with reduced respiratory muscle strength.
3	Wassim Melliti [30]	Effect of Six-Minute Walk Test and Incremental Exercise on Inspiratory Capacity, Ventilatory Constraints, Breathlessness and Exercise Performance in Sedentary Male Smokers without Airway Obstruction	2021	Original Article	The study has been able to detect the development of DH in smokers during submaximal exercise such asthe 6MWT and more pronouncedly during incremental CPET. IC Measurements were taken during exercise supplement standard measurements of ventilatory limitation and may provide further insight into exercise intolerance in smokers with preserved spirometry
4	Hidetaka Hamasaki [31]	Effects of Diaphragmatic Breathing on Health	2020	Narrative Review	Diaphragmatic Breathing may also be beneficial for reducing both physiologicaland psychological stress and could improve respiratory function and respiratory muscle strength
5	D. Lavanya Suhasini [32]	A Study to Assess the Effectiveness of Diaphragmatic Breathing Exercise in COPD Patients	2020	Original article	The researchers conclude that DBTP in patients with COPDleads to improvements in abdominal motion during NBand functional capacity. The researchers also showed that patients with a baseline level predominance of costal breathing and worse diaphragmatic mobility experienced a greater improvement

					in abdominal motion.
6	Iman Zahra etal [33]	Effects of Breathing Exercises onLung Volumes and Capacities Among Smokers	2020	Original Article	It was concluded that deep breathing exercises are useful among smokers. As deep breathing helps in improving lung volumes and capacities.
7	Özgür Bostanci et al[34]	Inspiratory muscle training improves pulmonary functions and respiratory muscle strength inhealthy male smokers	2019	Original Article	IMT significantly improvedthe respiratory muscle strength and pulmonary function of smokers. The mechanism responsible for this improvement is associated with increased respiratory muscle strength. On the other hand, smokershad higher increments in respiratory muscle strengthand pulmonary functions than non-smokers.
8	Ji Won Han etal [35]	Effect of breathing exercises combined with dynamic upper extremity exercises on the pulmonary function of young adults	2018	Original Article	The result is that breathing exercise with dynamic upper extremity exercise improves pulmonary function. Findings indicate that the breathing and dynamic upper extremityexercise described should be considered in patients who require breathing therapy since it seems to have beneficial effects on pulmonary function.
9	Kyo Chul Seo[36]	The effects of inspiratory diaphragm breathing exercise and expiratory pursed-lip breathing exercise on chronic stroke patients' respiratory muscle activation	2017	Original Article	The respiratory rehabilitation exercises is considered to be capable of inducing positive effects on stroke patients' respiratory muscles through the diaphragm breathing exercise and lip puckering breathing exercise.
10	Min-Sik Yonget al [37]	Effects of diaphragm breathing exercise and feedback breathing exercise on pulmonary function in healthy adults	2017	Original Article	Diaphragm breathing exercises and feedback breathing exercises can affect respiratory function

11	Hyun-Ju Junet al [38]	Effects of breathing exercises onlung capacity and muscle activities of elderly smokers	2016	Original Article	The results show that FBEand BBE improved the pulmonary functions of elderly smokers
12	Amany F. Elbehairy etal [39]	Mechanisms of exertional dyspnoeain symptomatic smokers without COPD	2016	Original Article	Regardless of the nature of the underlying physiological impairment in individual smokers, higher dyspnoea intensity ratings at a given work rate compared with controls were associated with higher contractile diaphragmatic effort and fractional inspiratory neural drive to the diaphragm
13	Kyo Chul Seoet al [40]	Effects of diaphragm respirationexercise on pulmonary function of male smokers in their the twenties	2015	Original Article	The experimental group which performed diaphragmrespiration exercises showeda greater improvement in pulmonary function as compared to the control group.
14	Hyun ju Jun etal [41]	Comparison of the Impact of Breathing Strengthening Exercises and Balloon Blowing Training on the Pulmonary Function of Elderly Smokers	2015	Original Article	FBT and BBT had a positive impact on the pulmonary function and minor respiratory muscles of an elderly smokers-home home breathing rehabilitation program.
15	Eldho Varghese [42]	Effectiveness of Diaphragmatic Breathing Exercise and Pursed Lip Breathing Exercise in Reducing Dyspnea in Patients with Acute Bronchial Asthma	2013	Thesis	There is a significant reduction of dyspnea in acuteasthmatic exacerbations along with bronchodilators using two breathing exercise training, in which pursed lip breathing training is more effective in the aspect of reduction of dyspnea than diaphragmatic breathing exercise.
16	Hyolyun Rohet al [43]	Respiratory Muscle training of pulmonary function for smokers and non-smokers	2012	Original Article	Respiratory muscle training was proven to be effective at improving pulmonary function.

17	Jeena Princy,D [44]	A study to analyze the effect of various positions along with coughing and huffing techniqueson respiratory parameters in smokers	2012	Thesis	This study concludes that there is a significant improvement in FEV1, FEV1/FVC, and FEV1/FEV6 following the interventions of coughing and huffing techniques in smokers
18	Manuel Gimenez et al[45]	Bilevel exercise training and directed breathing relieves exertional dyspnea for male smokers	2012	Original Article	This study suggests that the decline in exercise tolerance for male smokers can be reduced by intensive exercisetraining (SWEET) and comprehensive directed breathing but not by moderate training and traditional diaphragmatic breathing.
19	Kateřina Burianová etal [46]	The Effect Of 8 Week Pulmonary Rehabilitation Programme on Chest Mobility and Maximal Inspiratory and Expiratory Mouth Pressure in Patients with Bronchial Asthma	2008	Original Article	From the given results it can be concluded that a combination of special breathing and postural exercises and mobilization and soft tissue techniques hasa positive effect on the chest mobility and respiratory muscle strength of AB patients.
20	Mervat A. Mohamed et al[47]	Effect of Two Deep Breathing Techniques on Arterial Blood Gases in Smoker and Non-Smoker Patients after CABG	2005	Original Article	This study concluded that the current study revealed that both modalities resulted in improving arterial oxygenation with the superiority of IS to Diaphragmatic Breathing.
21	Yoshio Kobayashi etal [48]	Effects of Habitual Smoking on Cardiorespiratory Responses toSub-maximal Exercise	2004	Original Article	The present study indicates that habitual cigarette smoking has a significant detrimental effect on cardiorespiratory functions during moderately heavy exercise related to decreasedO2 carrying capacity. However, more subtle effectsare already apparent at lighter exercise levels in the form of inefficient pulmonary and tissue gas exchange, as manifested by elevated V˙ E/V˙O2 ratios, reduced O2 pulse values, anda slower HR recovery following exercise.

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DISCUSSION

Diaphragmatic Breathing exercise has various physiological effects on humans. The diaphragm is the major respiratory muscle. The movement of the diaphragm has a positive correlation with the lung volume using the diaphragm consciously during respiration increases the lung capacity.

India is currently experiencing a steady increase in the smoking rate. In all likelihood, this population is at a greater risk of developing respiratory diseases in the future. Respiration training in addition to psychological and medical treatments should be an active intervention in any anti-smoking program; however, in reality, the approach to professional respiration training is very limited and depends on simple respiration exercises.

These breathing exercises are learned easily; a person can perform these exercises at any time and any place. Some studies have shown significant progresses in pulmonary function with diaphragmatic breathing techniques.

The study was conducted to determine the effectiveness of diaphragmatic breathing exercises on pulmonary function among smokers. The study showed improvement in some parameters and others remain the same. Significant improvement was seen in vital capacity, forced expiratory volume, and oxygen saturation while other parameters were not significantly improved.

The conducted study supports the current study that deep breathing exercises are operational for intercostal muscles which help to improve breathing, lung capacities and volume, oxygen saturation, and ultimately the quality of life.

Other studies show that deep breathing exercises effectively reduce stress and improve mood. Research shows that deep breathing exercises are very effective in obstructive lung diseases as the above-mentioned research indicates. In another study that was conducted in 2016, the Blowing balloon workout is an operative way of improving lung functions and relieving stress in medical students. The above-mentioned studies support the current study that deep breathing exercises were beneficial in improving lung functions. These exercises are also useful in improving the partial pressure of oxygen. Deep breathing exercises work as anti-smoking and deliver essential evidence for exercises and provide valuable directions for the development of interventions that help in smoking cessation.

There is a lack of awareness among people regarding exercises and their useful effects, so they did not follow the exercise plan properly, there is a need to give awareness.

CONCLUSION

Previous original Articles and systematic reviews have shown that Diaphragmatic Breathing exercise is effective in improving pulmonary functions. the exercise capacity and RR in patients with COPD. On the other hand, Diaphragmatic Breathing could also deteriorate dyspnea in severe COPD patients. Moreover, Diaphragmatic Breathing exercises may also be beneficial for reducing both physiological and psychological stress and could improve respiratory function and respiratory muscle strength, but more firm evidence will be needed in the future.

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