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Research Article

Physiotherapy for better medical therapy

Effect Of Posture Correction And Moderate Intensity Exercises On Respiratory System In Teenagers.

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Abstract: Teenage is the time of shaping health behaviour and preventing postural defects and improving respiratory fitness. The teenagers possess insufficient knowledge about their respiratory system. Postural defects are commonly seen among teenagers due to lack of physical activity and poor postural habits which can lead to non harmonious development of organs and affect respiratory system as well. For efficient respiratory function, moderate intensity exercises with posture correction would be useful. There is a paucity of literature showing the effect of posture correction and moderate intensity exercises on respiratory system in teenagers, hence this study would be helpful to analyse the same. Objective of our study is to find out the effect of posture correction exercise on the respiratory system in teenagers and to find out the effect of moderate intensity exercises on the respiratory system in teenagers. The study was carried out in the karad area. The subjects were selected according to inclusion and exclusion criteria. Total 35 subjects participated in this study. Prior consent and assent form was taken. Aim and procedure were explained to the subjects in their preferred language before data collection. Pre and post assessment was done by a 6 minute walk test for respiratory function and flexicurve was measured using flexible ruler to recognize spinal postural defect. Peak flow meter was used to measure lung function In this study, 6minute walk test, peak flow meter and flexicurve showed statistically significant difference between pre and post treatment values. On the basis of the result of the study, it can be concluded that posture correction and moderate intensity exercises helps in improving respiratory function in teenagers.

Keywords: Moderate intensity exercise, spine posture correction, teenagers, metabolic equivalent, respiratory system.

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1. INTRODUCTION

Teenage is the time of shaping health behaviour. Throughout life there are various body posture changes that occur. Teenage is the age where most dynamic changes occur. The type of posture depends on many factors such as age, gender, day today activities.[1] If the postural defects are left untreated, it may cause spinal deformities in the spine and also can affect compliance of the lungs, function of lung and motor system. Further it can also affect respiratory function due to low oxygen consumption. Lack of physical activity can also cause spinal deformities. Conditions of the external environment in which individuals life has a great impact on the posture.[2] Currently teenagers spend most of their time in sedantary activities such as watching television and playing video games or mostly play indoor games. Also habits like wearing school bags on one arm, improper adjustment of school desk to the individual's height, standing with stress on one leg, and other psychological factors can also cause poor postural habits[1]. An increasing deformity in the spine can also affect the psyche of the individual and lack of acceptance of body image. Neglected or untreated postural habits can further cause defects like scoliosis, rounded shoulders, flat back, kyphosis[1,2]. Postural defects are more commonly found in girls compared to boys. Where the thoracic hyperkyphosis were prevalent in boys at the age of 14 years.[3] Low level of physical activity not only affects the posture but also the development of osteoarticular system and thus further affects development of the body. Physical development is marked by increase in sources of energy that are provided in the anaerobic metabolism. The effect of this change improves exercise capacity. These abilities close by the end of the maturation. Hence it is important to stimulate physical activity at a young age because it has beneficial effects on health which also influences adult life. [2] Metabolic equivalent (MET) is defined as resting metabolic rate, which is the amount of oxygen consumed at rest, and is equal to 3.5 ml o_2 per kg body weight per minute. METS are used to describe the functional capacity of the individual and provide repertoire of activities in which individuals can safely participate. Activities requiring only 1- 4 METS are considered low intensity activities and are not suitable for improving respiratory function in normal individuals. Activities in the 5-8 METS are considered as moderate intensity activities and are sufficient for sedentary persons. Activities in the METS above 8 is considered as high intensity activities and are vigorous for fit individuals.[4] Moderate intensity activities are beneficial for respiratory health. Physically active individuals have controlled blood pressure, favourable plasma lipoprotein profile. Respiratory endurance training is associated with increased levels of circulating high density lipoprotein and reduction of triglyceride level.[5]

1.1 Moderate intensity exercises

1.1.1 Cardiac effect

They stimulate small myelinated and unmyelinated fibres in skeletal muscles and increases myocardial activity. It involves sympathetic nervous system response which includes peripheral vasoconstriction in non exercising muscles, increase in heart rate, increase in systolic blood pressure[6]

1.1.2 Peripheral effect

It causes generalized vasoconstriction that allows blood to be shunted from non working muscles to working muscles. There is an increase in stroke volume, heart rate, cardiac output, blood flow through working muscles because increase in myocardial contractility. There is also an increase in systolic blood pressure.[6]

1.1.3 Respiratory response

Gas exchange increases across the alveolar capillary membrane. Alveolar ventilation also increases by 10 to 20 fold during exercise to supply additional oxygen requirements. [6,8]

1.1.4 Posture correction

Posture correction exercise contributes to an increase in lung capacity and increase in depth of breath. Posture correction exercise also positively affects the nervous system through simulating the process of maturing the motor areas of the brain which contribute to the locomotor skill. All the above factors help in improving posture. [6,7,8] Respiratory fitness is an important indicator of health which can be measured by a 6 min walk test which is used to assess blood pressure, pulse rate and level of dyspnoea can be assessed.[9,10.] Peak flow meter also helps measure lung function. As altered posture can affect respiratory function, posture correction is very important. Most spinal postural defects can prevent respiratory function.[11,12] Flexicurve using flexi ruler is the reliable method to assess spine postural defects. Cervical lordosisindex , kyphosis index and lumbar index is used to measure defects at cervical, thoracic and lumbar spine respectively.[13,14,15] Prevention of postural impairments is a very difficult procedure of securing general health both physically and mental. This problem is commonly seen among teenagers and adolescents because during this phase there are many risk factors which can cause posture disorders and these disorders can affect future life. Thus posture correction exercises and moderate intensity exercises can help in improving respiratory system. Thus our objective of the study is to find out the effect of posture correction exercise on the respiratory system in teenagers and to find out the effect of moderate intensity exercises on the respiratory system in teenagers.

2. MATERIALS AND METHODS

The subjects were selected according to inclusion and exclusion criteria. Total 35 subjects were taken according to inclusion criteria. The inclusion criteria were subjects with age group between 12 to 18 years and having spinal postural defect. The exclusion criteria were subjects with any recent surgery, any recent trauma, structural deformity, any systemic diseases, and unexplained weight loss. Demographic data of the subjects was also taken. Prior consent and assent form was taken. Aim and procedure were explained to the subjects in their preferred language before data collection. Pre and post assessment was done by a 6 minute walk test for respiratory function and flexicurve was measured using flexible ruler to recognize spinal postural defect. Peak flow meter was used to measure lung function. Included participants received moderate intensity exercises for 30 minutes daily for 5 times a week. Exercises are run and jump in place, jumping jacks, side to side hop and standing side hop. Participants also received exercises for posture

correction. Exercises are chin tuck in 3 sets 10 repetition, scapular retraction 3 sets 10 repetition, cat and camel 3 sets 10 repetition, Patient was taught about reinforcement to reinforce proper performance by using cues throughout the day to check correct posture. The effect of treatment was noted using outcome measures. The experimental results were also statistically analyzed.

2.1 Ethical clearance

This study has undergone ethical clearance through the university level ethical committee with Protocol number is 0102/2019-2020.

3. STATISTICAL ANALYSIS

The paired T test and one way ANOVA test were used for analysis of data. Statistical analysis of recorded data was done using the software SPSS version 20.

3.1 Age and gender wise distribution

Table1. Age and gender wise distribution

Serial no.	Age group	Subjects	Gender	
	Age group	Total	Male	Female
1	12-15 years	21	10	11
2	16-18 years	14	8	6

Above table no. 1 represents, two age groups i.e. 12-15 years which consist of 21 subjects (male-10 and female- 11) and in other age group 16 to 18 years which consist of 12 subjects (male-8 and female- 6).

3.2 Walking distance in 6 min walk test

Table 2. Walking distance in 6 minute walk test.

	Pre	Post	P Value	Inference
Mean±SD	508±126.37	544.14±121.95	0.0007	Extremely significant

Above table no. 2 represents, in the present study pre interventional mean and standard deviation of walking distance in the 6 min walk test was508±126.37, whereas post interventional Mean±SD was 544.14±121.95. It concluded that interference was considered extremely significant.

3.3 Peak flow meter

Table 3. Peak flow meter

	Y	G	P value	Inference
Pre	21	14	0.0079	Very significant
Post	9	26		

Above table no. 3 represents, in pre interventional study 21 subjects were in Y Zone while 14 subjects were in G zone whereas in post interventional study 9 subjects were in Y Zone and 26 subjects were in G zone. This was calculated by the chi- square test. It concluded that interference was considered extremely significant.

3.4 Cervical lordosis index

Table 4. Cervical lordosis index

	Pre	Post	P Value	Inference
Mean±SD	31.142±5.151	29.857±4.440	0.0007	Extremely significant

Above table no. 4 represents, in the present study pre interventional mean and standard deviation of cervical lordosis index was31.142±5.151, whereas post interventional Mean±SD was 29.857±4.440. It concluded that interference was considered extremely significant.

3.5 Kyphosis index

Table 5. Kyphosis index

	Pre	Post	P Value	Inference
Mean±SD	34.74±5.83	31.44±5.74	<0.0001	Extremely significant

Above table no. 5 represents, in the present study pre interventional mean and standard deviation of kyphosis index was34.74±5.83, whereas post interventional Mean±SD was 31.44±5.74. It concluded that interference was considered extremely significant.

3.6 Lumbar index

Table 6. lumbar index

Pre	Post	P Value	Inference

Mean±SD	48.45±11.622	45.94±11.877	0.0095	Very significant

Above table no. 6 represents, in the present study pre interventional mean and standard deviation of lumbar index was 48.45±11.622, whereas post interventional Mean±SD was 45.94±11.877. It concluded that interference was considered extremely significant.

4. DISCUSSION

Throughout life there are various body posture changes that occur. Teenage is the age where most dynamic changes occur. The type of posture depends on many factors such as age, gender, day today activities. If the postural defects are left untreated it may cause spinal deformities in the spine and also can affect development of lungs and other motor organs. Further it can also affect respiratory function due to low oxygen consumption. This research was undertaken with the aim to study the effect of posture correction and moderate intensity exercises on respiratory system in teenagers. The study was carried out and the result was drawn by a 6 min walk test, peak flow rate and flexicurve by using flexible ruler. The study was carried out in the karad area. Subjects with a sample of 50 were screened for inclusion and exclusion criteria. Subjects fulfilling inclusion criteria were recruited in the study with a sample of 35. Total 35 Prior consent and assent form was taken. Aim and procedure were explained to the subjects in their preferred language before data collection. Pre and post assessment was done by 6 minute walk test for respiratory function and flexicurve was measured using flexible ruler to recognize spinal postural defect. Peak flow meter was used to measure lung function. Included participants received moderate intensity exercises for 30 minutes daily for 5 times a week. Participants will also receive exercises for posture correction. According to previous study of Michel Latalski, Jerzy Bylina , Marek Fatyga , et al Risk factor of postural defects in children at school age. The study concluded that there is a relation between physical activity and occurrence of postural defect in children and identification and recognition of risk factors may facilitate their elimination.[1] Hence postural correction exercises may help to prevent postural defects. Also moderate intensity exercises increase gas exchange across the alveolar capillary membrane. Alveolar ventilation also increases by 10 to 20 fold during exercise to supply additional oxygen requirements. It was found that among 35 subjects, 64% subjects belonged to 12-15 years of age group and remaining 36% belonged to 16-18 years of age group. In the age group there were 21 subjects out of whom 10 were males and 11 were females. In the age group there were 14 subjects out of whom 8 were males and 6 were females. Pre interventional mean and standard deviation of walking distance in the 6 min walk test was 508±126.37, whereas post interventional Mean±SD was 544.14±121.95. It concluded that interference was considered extremely significant. (P-0.0007, t-3.719). According to American lung association there are three zones used to measure peak flow rate. They are Green zone (G) which indicate 80 to100 percent of your normal peak flow rate and condition is under control. Yellow zone (Y) which indicates 50 to 80 percent of usual or normal peak flow rate and airways are narrowing and may require treatment and red zone which indicates less than 50 percent of normal rate. It shows that airways are severely narrowing and its medical emergency. As per the present study there were no subjects in the red zone. In pre interventional study 21 subjects were in Y Zone while 14 subjects were in G zone whereas in post interventional study 9 subjects were in Y Zone and 26 subjects were in G zone. This was calculated by the chi- square test. It concluded that interference was considered extremely significant. (p-0.0079). According to the study of Wendy Rheault, MA, Steve ferris, et al , Intertester reliability of the flexible ruler for the cervical spine , the study was done to determine whether flexible ruler had intertester reliability for the cervical spine curvature in normal subjects and the data suggested that flexible ruler is reliable tool for measuring cervical spine curvature.[15] As per the present study pre interventional mean and standard deviation of cervical lordosis index using flexible ruler was 31.142±5.151, whereas post interventional Mean±SD was 29.857±4.440. It concluded that interference was considered extremely significant. (P-0.0007, t-3.707). According to the study of Teri L Yanagawa, Murray E. Maitland, Keith Burgess, et al. Assessment of thoracic kyphosis using the flexicurve for individuals with osteoporosis, the study was done to assess the test- retest reliability of the measurements of thoracic kyphosis using flexicurve ruler with individuals with osteoporosis and the study concluded that flexicurve ruler can be used for the measurement of kyphosis in elderly women with osteoporosis based on reliability outcome.[16,17] As per the present study pre interventional mean and standard deviation of kyphosis index was 34.74±5.83, whereas post interventional Mean±SD was 31.44±5.74. It concluded that interference was considered extremely significant. (P-<0.0001, t-5.732). Pre interventional mean and standard deviation of the lumbar index was48.45±11.622, whereas post interventional Mean±SD was 45.94±11.877. It concluded that interference was considered extremely significant. (P-0.0095, t-2.750).

5. CONCLUSION

On the basis of the result of our study, it can be concluded that posture correction and moderate intensity exercises helps in improving respiratory function in teenagers. This study concluded that there was improvement in posture which improved respiratory system function. There is a significant effect of posture correction and moderate intensity exercises on respiratory function in teenagers.

6. FUNDING ACKNOWLEDGEMENT

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7. AUTHORS CONTRIBUTION STATEMENT

Sakshi Shah developed the theoretical formalism, performed the analytic calculation and performed the numerical simulations. Both Sakshi Shah and Dr. Poonam Patil contributed to the final version of the manuscript. Dr. Poonam Patil supervised the project.

8. CONFLICTS IF INTEREST

Conflict of interest declared none.

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