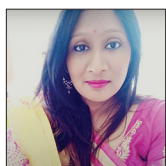


Original Article

## Effect of posture correction and moderate-intensity exercises on respiratory system in teenagers

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### ABSTRACT

**Objective:** Teenage is the time of shaping health behavior and preventing postural defects and improving respiratory fitness. The teenagers possess insufficient knowledge of 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 analyze the same. The objectives of the study were to find out the effect of posture correction exercise on respiratory system in teenagers and to find out the effect of moderate-intensity exercises on respiratory system in teenagers.

**Materials and Methods:** The study was carried out in Karad area. The subjects were selected according to the inclusion and exclusion criteria. A total of 35 subjects were participated in this study. Prior consent and assent form was taken. The aim and procedure were explained to the subjects in their preferred language before data collection. Pre- and post-assessment was done by 6 min 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.

**Results:** In a conducted study, 6 min walk test, peak flow meter, and flexicurve showed statistically significant difference between pre- and post-treatment values.

**Conclusion:** On the basis of the result of the study, it can be concluded that posture correction and moderate-intensity exercises help in improving respiratory function in teenagers.

**Keywords:** Moderate-intensity exercise, Spine posture correction, Teenagers, Metabolic equivalent, Respiratory system

### INTRODUCTION

Teenage is the time of shaping health behavior. Throughout the life there are various postural changes occurs due to growing age. Teenage is the age where most dynamic changes occur. The type of posture depends on many factors such as age, gender, and day-to-day activities.<sup>[1]</sup>

If the postural defects are left untreated, it may cause spinal deformities in the spine and also can affect the development of lungs and other motor organs. 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 live have

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great impact on the posture.<sup>[2]</sup> Nowadays, teenagers spent most of their time in leisure activities such as watching television and playing video games and mostly play indoor games. Furthermore, habits such as wearing school bags on one arm only, maladjustment of school desk to the individual's height, standing with stressing on one leg, and other psychological factors can also cause poor postural habits.<sup>[1]</sup>

An increasing deformity in the spine can also affect psyche of the individual and lack of acceptance of body image. Neglected or untreated postural habits can further cause defects such as scoliosis, rounded shoulders, flat back, and kyphosis.<sup>[1,2]</sup> Postural defect is more commonly found in girls compared to boys where the thoracic hyperkyphosis was prevalent in boys at the age of 14 years.<sup>[3]</sup>

Low level of physical activity not only affects the posture but also the development of osteoarticular system and thus future development of the body. The physical development is marked by increase in sources of energy that is 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 in younger age because it has beneficial effect on health which also influences adult life.<sup>[2]</sup>

Metabolic equivalent (MET) is defined as resting metabolic rate, that is, amount of oxygen consumed at rest, which is equal to 3.5 ml O<sub>2</sub>/kg body weight/min. METs are used to describe the functional capacity of the individual and provide repertoire of activities, in which individual 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 are considered as high-intensity activities and are vigorous for fit individuals.<sup>[4]</sup>

Moderate-intensity activities are beneficial for respiratory health. Physically active individuals have controlled blood pressure and favorable plasma lipoprotein profile. Respiratory endurance training is associated with increased levels of circulating high-density lipoprotein and reduction of triglyceride level.<sup>[5]</sup>

### Moderate-intensity exercises

#### *Cardiac effect*

They stimulate small myelinated and unmyelinated fibers in skeletal muscles and increase myocardial activity. It involves sympathetic nervous system response which includes peripheral vasoconstriction in non-exercising

muscles, increase in heart rate, and increase in systolic blood pressure.

#### *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, and blood flow through working muscles because increase in myocardial contractility. There is also increase in systolic blood pressure.

#### *Respiratory response*

Gas exchange increases across the alveolar-capillary membrane. Alveolar ventilation also increases by 10–20-fold during exercise to supply additional oxygen requirement.<sup>[6,7]</sup>

#### *Posture correction*

Posture correction exercise contributes to an increase in lung capacity and increase in depth of breath. Posture correction exercise also positively affects nervous system through simulating the process of maturing the motor areas of brain which contributes to the locomotor skill. All the above factors help in improving posture.<sup>[6,8]</sup>

Respiratory fitness is important indicator of health which can be measured by 6 min walk test which is used to assess blood pressure, pulse rate and level of dyspnoea can be assessed.<sup>[9,10]</sup> Peak flow meter also helps measure lung function. As altered posture can affect respiratory function, posture correction is very important. Mostly spinal postural defects can prevent respiratory function.<sup>[11,12]</sup> Flexicurve using flexi ruler is the reliable method to assess spine postural defects. Cervical lordosis index, kyphosis index and lumbar index is used to measure defects at cervical, thoracic and lumbar spine respectively.<sup>[13-15]</sup>

Prevention of postural impairments is a very difficult procedure of securing general health both physical 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.

## MATERIAL AND METHODS

This was a study to find the effect of posture correction and moderate-intensity exercises on respiratory system in teenagers. The study was carried out in Karad area. The subjects were selected according to the inclusion and exclusion criteria. A total of 35 subjects were taken according to the inclusion criteria.

The sample size was obtained from Krishna School, Karad. The inclusion criteria were subjects with the age group between 12 and 18 years and subjects 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 were taken. Prior consent and assent form was taken. The aim and procedure were explained to the subjects in their preferred language before data collection. Pre- and post-assessment was done by 6 min 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 min daily for 5 times/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 three sets 10 repetitions, scapular retraction three sets 10 repetitions, and cat and camel three sets 10 repetitions. Patient was taught about reinforcement to reinforce proper performance using cues throughout the day to check correct posture. The effect of treatment was noted using outcome measures. The study duration was 6 months. The experimental results were statistically analyzed.

### 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.

## RESULTS

### Interpretation

**Table 1:** Age- and gender-wise distribution.

Age group	Subjects	Gender	
Age group	Total	Male	Female
12–15 years	21	10	11
16–18 years	14	8	6

Table 1 represents two age groups, i.e., 12–15 years which consist of 21 subjects (male – 10 and female – 11) and in another age group 16–18 years which consist of 12 subjects (male – 8 and female – 6).

### Interpretation

**Table 2:** Walking distance in 6 min walk test.

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

In the present study, pre-interventional mean and standard deviation of walking distance in 6 min walk test was 508 ±

126.37, whereas post-interventional mean ± SD was 544.14 ± 121.95 [Table 2]. It concluded that interference was considered extremely significant.

### Interpretation

**Table 3:** Peak flow meter.

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

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 [Table 3]. This was calculated by Chi-square test. It concluded that interference was considered extremely significant.

### Interpretation

**Table 4:** Cervical lordosis index.

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

In the present study, pre-interventional mean and standard deviation of cervical lordosis index was 31.142 ± 5.151, whereas post-interventional mean ± SD was 29.857 ± 4.440 [Table 4]. It concluded that interference was considered extremely significant.

### Interpretation

**Table 5:** Kyphosis index.

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

In 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 [Table 5]. It concluded that interference was considered extremely significant.

### Interpretation

**Table 6:** Lumbar index.

	Pre	Post	P value	Inference
Mean±SD	48.45±11.622	45.94±11.877	0.0095	Very significant

In the present study, pre-interventional mean and standard deviation of lumbar index was 48.45 ± 11.622, whereas post-

interventional mean  $\pm$  SD was  $45.94 \pm 11.877$  [Table 6]. It concluded that interference was considered extremely significant.

## DISCUSSION

Throughout the life, various body posture changes occur. Teenage is the age where most dynamic changes occur. The type of posture depends on many factors such as age, gender, and day-to-day activities. If the postural defects are left untreated, it may cause spinal deformities in the spine and also can affect the 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 6 min walk test, peak flow rate, and flexicurve using flexible ruler.

The study was carried out in 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. A total of 35 prior consent and assent form were taken. The aim and procedure were explained to the subjects in their preferred language before data collection.

Pre- and post-assessment was done by 6 min 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 min daily for 5 times a week. Participants will also receive exercises for posture correction.

The study of Latalski *et al.*, risk factor of postural defects in children at school age concluded that there is a relationship between physical activity and occurrence of postural defects in children and identification and recognition of risk factors may facilitate their elimination. Hence, postural correction exercises may help to prevent postural defects.

Furthermore, moderate-intensity exercises increase gas exchange across the alveolar-capillary membrane. Alveolar ventilation also increases by 10–20-fold during exercise to supply additional oxygen requirement.

It was found that among 35 subjects, 64% of 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 male and 11 were female. In the age group, there were 14 subjects, out of whom 8 were male and 6 were female.

Pre-interventional mean and standard deviation of walking distance in 6 min walk test was  $508 \pm 126.37$ , whereas post-

interventional mean  $\pm$  SD was  $544.14 \pm 121.95$ . It concluded that interference was considered extremely significant ( $P = 0.0007$ ,  $t = 3.719$ ).

According to the American Lung Association, there are three zones used to measure peak flow rate. They are green zone (G) which indicates 80–100% of your normal peak flow rate and condition is under control. Yellow zone (Y) which indicates 50–80% of usual or normal peak flow rate and airways are narrowing and may require treatment and red zone which indicates <50% 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 Chi-square test. It concluded that interference was considered extremely significant ( $P = 0.0079$ ).

According to the study of Rheault *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.<sup>[15]</sup> As per the present study, pre-interventional mean and standard deviation of cervical lordosis index using flexible ruler was  $31.142 \pm 5.151$ , whereas post-interventional mean  $\pm$  SD was  $29.857 \pm 4.440$ . It concluded that interference was considered extremely significant ( $P = 0.0007$ ,  $t = 3.707$ ).

According to the study of Yanagawa *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.<sup>[16,17]</sup> As per the present study, pre-interventional mean and standard deviation of kyphosis index was  $34.74 \pm 5.83$ , whereas post-interventional mean  $\pm$  SD was  $31.44 \pm 5.74$ . It concluded that interference was considered extremely significant ( $P < 0.0001$ ,  $t = 5.732$ ).

Pre-interventional mean and standard deviation of lumbar index was  $48.45 \pm 11.622$ , whereas post-interventional mean  $\pm$  SD was  $45.94 \pm 11.877$ . It concluded that interference was considered extremely significant ( $P = 0.0095$ ,  $t = 2.750$ ).

## CONCLUSION

On the basis of the result of the study, it can be concluded that posture correction and moderate-intensity exercises help in improving respiratory function in teenagers. This study concluded that there was an 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.

#### Authors' contributions statement

Dr. Poonam Patil guided me in conducting this research study, helped me in evaluating the results.

#### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms.

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#### Conflict of interest

Institutional review board permission obtained.

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