



EFFECT OF PILATES ON CARDIO-RESPIRATORY FUNCTIONS IN CHILDREN WITH DOWNS SYNDROME

Pediatric Physiotherapy

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ABSTRACT

BACKGROUND: Pilates comprises exercises that involve entire body to improve strength and concentration towards the targeted area. It targets deepest muscles of the body. Downs Syndrome was introduced by John Langdon Down in the year 1866. Downs syndrome is one of the most common chromosomal abnormality, also called trisomy 21. Children with Downs's syndrome majorly suffer with cardiopulmonary complications.

OBJECTIVE: The objective of this study is to analyze and observe the effect of Pilates training on PEFR, 3min walk test & SPO₂ in children with downs syndrome.

METHODS: Children's with Downs's syndrome between the ages of 8 to 18 years were randomly divided into two groups. Group A underwent Pilates training and Group B was control group. The exercises were conducted for 12 sessions, five days in a week. The session lasted for 30 minutes including warm up and cool down period.

CONCLUSIONS: It concludes that Pilates is one of the effective training programs to increase the cardiopulmonary functions in children with Downs's syndrome.

KEYWORDS

Cardiopulmonary functions, Downs syndrome, PEFR, Pilates, 3 min walk test, SPO₂, Functional & Mobility Exercises

INTRODUCTION:

The term Downs Syndrome was introduced by John Langdon Down in the year 1866. Dr. Jerome Lejeune described the association on downs with chromosome 21 in Paris. Downs syndrome is defined as abnormality of chromosome 21 and the prevalence of such children occurs in 1 per 600 live births. Due to medical conditions, the average life span of Down syndrome child is 10 years lesser than the normal person. Complications like obesity, diabetes, Alzheimer's diseases, childhood leukemia, and thyroid are also seen in such children.^{2,3}

Downs syndrome individuals also show delay in reaction time and equilibrium reactions. Also have decreased level of motor coordination, balance and sensory integration.³ The characteristic appearance Downs syndrome children : flat nasal bridge, upward slanted eyes, small chin, single crease along the palm, protruding frontalle, small mouth and a large tongue, short fingers, epicanthal skin, white spots on iris, abnormal pattern of finger print, big toe, sandle type distance between first toe and the second toe, flat foot.⁴ This leads to pulmonary hypertension, obstructive sleep apnea, recurrent pulmonary aspiration, pneumonia, structural lung abnormality, suppurative lung diseases, and pulmonary hypoplasia.. The loss of capillary surface area and preterm birth which is a cause of reduced alveolar development, eventually leads to pulmonary hypertension.⁵ This study is to analyze the effect of Pilates on cardiopulmonary functions in children with downs syndrome.

MATERIAL & METHODS:

An experimental study conducted on children with Down syndrome between the age of 8 to 18 years from Kamiyani school Nigdi, Saisaunkar school Bhosari in Pune, Maharashtra. The study protocol was approved by the ethics committee of college prior starting the study.

INCLUSION CRITERIA:

- Medically Confirmed Down's syndrome children (8 - 18 years)
- I.Q above 50 according to the government certificate
- Children without serious auditory or visual problems.

EXCLUSION CRITERIA:

- Children with history of cardio pulmonary or orthopedic surgeries
- Children with history of cardiothoracic abnormalities
- Children with respiratory infection and back or neck pain history in recent few weeks.
- Children needing assistive device for walking.
- Children unable to follow commands
- Children irregular to school

All those who fulfilled the inclusion criteria were eligible to participate in the study. The purpose of the study explained to parents of patients, Informed written consent were taken from parents prior to actual participation of patient into the study.

Assessment sheet includes all demographic information, BMI, recent medical history, chest deformities etc. All Downs syndrome children were randomly divided into two groups with 15 children each. One group receives Pilates exercises (Group A) while another receives Functional & mobility exercises (Group B). Pulmonary function test (PEFR), oxygen saturation by pulse oximeter and number of lapse covered in 3 min walk test as outcome measures were recorded prior starting intervention.

Group A (Pilates exercises)	Group B (Functional & mobility exercises)
Pilates exercises : Warm up with slow deep breathes	warm up : arm rotations, pelvic rotations, jumping jacks, spot jogging , leg kicks
• Mermaid (10 reps 5 sec hold)	back extensions
• Spine twist (10 reps , both sides, 5 sec hold)	o Step ups (30)
• Spine stretch (10 reps, 5 sec hold)	o Sprints (30 sec)
• The Hundreds (till 100 counts)	o Wand arm exercises
	o Spot marching

The protocol for exercises was of 12 sessions (5 days in a week), the exercises lasted for 30 minutes including rest period. After exercises a cool down period of 10 minutes was given before going back to their respective classes. The PEFR, 3min walk test and pulse oximeter findings were assessed again after end of the 12th sessions of exercises.

The statistical analysis was done by using SPSS software 20 version, quantitative data was presented as mean $\pm$ standard deviation (SD), repeated measures ANOVA test used to compare effect of intervention before and after sessions of exercises.

RESULTS:

Mean age of 30 Down's syndrome children (M-14, F-16) was 12.5 years with standard deviation of 1.66 years; 22 children was in 11-14 years of age group. Mean peak expiratory flow rate was after giving intervention to Down's syndrome children was significantly higher than before interventions in both group ($p=0.00$) and there was no significant difference in Pilates Exercises and Functional & mobility exercises receiving group ($p=0.121$).

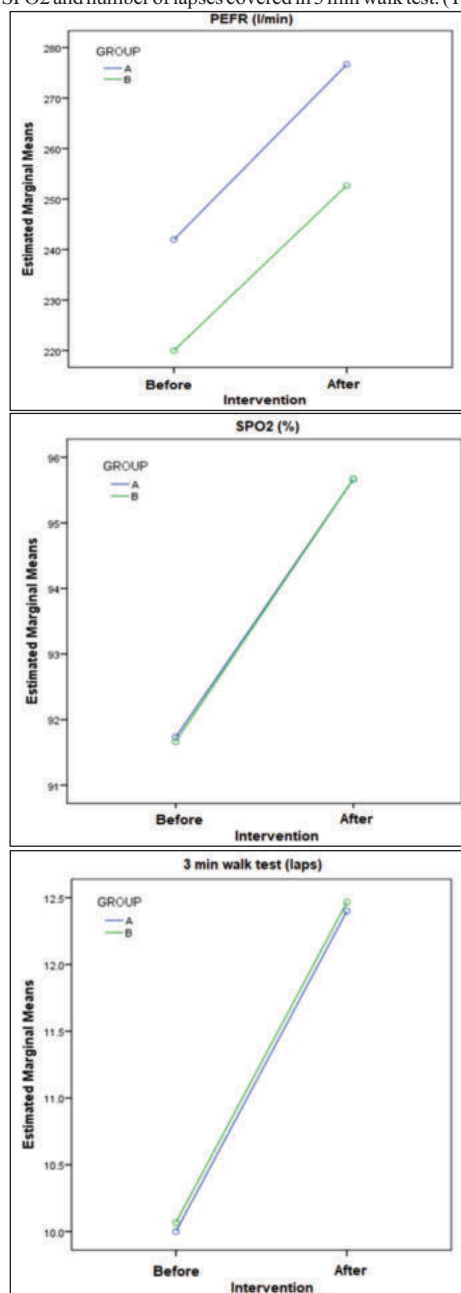
Table 1: Descriptive Statistic

Variable	Group	Mean	Std. Deviation
PEFR (l/min) Before intervention	A	242.00	49.019
	B	220.00	28.536

PEFR (l/min) After intervention	A	276.67	50.521
	B	252.67	23.442
SPO2 (%) Before intervention	A	91.73	2.631
	B	91.67	1.589
SPO2 (%) After intervention	A	95.67	2.320
	B	95.67	1.952
3 min walk test (laps) Before intervention	A	10.00	2.171
	B	10.07	1.710
3 min walk test (laps) After intervention	A	12.40	2.165
	B	12.47	1.995

A = Pilates Exercises, B = Functional & mobility exercises

Mean oxygen saturation before intervention was approximately similar in Pilates receiving group and group receiving Functional & mobility exercises (91.73% & 91.67% respectively) which increases in both groups significantly after intervention ($p=0.00$) without any significant difference between them ($p=0.964$) after intervention. Similarly both groups shows significant increased capacity of lapses in 3 min walk test after intervention in comparison with mean lapses covered before intervention ($p=0.00$) without significant difference between them ($p=0.927$) after intervention. Above findings suggests that Pilates Exercises are as effective as Functional & mobility exercises to increased PEFR, SPO₂ and number of lapses covered in 3 min walk test. (Table 1)



DISCUSSION:

This study was concluded to analyze the effect of Pilates and functional & mobility exercise protocol on cardiorespiratory parameter like PEFR, 3 Min Walk Test, SPO₂ (oxygen saturation) in children suffering from Down's syndrome. According to the inclusion and exclusion criteria, the children with Down's syndrome divided into two group in which group A received pilates exercise and group B received functional & mobility exercise. On both the group the cardiorespiratory parameter were measured before & after interventions. And the parameter in both the groups were compared, Graph one it was observed that mean PEFR value before intervention were 242 lit/min in group A and 220 lit/min in group B same parameter has been measured after intervention it was observed that mean PEFR value were 276 lit/min in group A and 252 lit/min in group B. We found that there is an increase in mean PEFR value after interventions but there is no significant difference between the pilates receiving group and functional & mobility exercise group. This study is supported by Angeles Bond Rosell Rayes, Claudio Andre B et al who conducted a study to verify and compare the effects of Pilates versus Aerobic training on Cardiorespiratory Fitness, isokinetic muscular strength, Body Composition & functional task outcomes for individuals who are overweight and obese, he concluded that Pilates is one of the alternative physical training method for individuals those who are overweight as it promotes significant effects in cardiorespiratory fitness, body composition & performance on functional tests.⁶

This is supported by Harneet Kaur, Maman Paul et al who conducted a study to observed the effects of Pilates exercise on pulmonary function & static respiratory pressure ,cardiorespiratory & musculoskeletal parameter, he found that significant improvement of pulmonary function after the post Pilates training Some parameters of the pulmonary function were also improved along with the improved thoracoabdominal mobility so he concluded that Pilates exercise training is used for enhancing the respiratory function.⁷

The second graph shows the SPO₂ oxygen saturation which is our second cardiorespiratory parameter, it has been observed in this graph that before interventions mean SPO₂ were 91.73 in group A and 91.72 in group B but after interventions it has increased in both the group which is 95.67 respectively, it is found that there is no statistically significant difference between the pilates receiving group and the functional and mobility exercise group. This is supported by Harneet Kaur, Maman Paul et al who conducted a study to observed the effects of Pilates exercise on pulmonary function & static respiratory pressure ,cardiorespiratory & musculoskeletal parameter, he found that significant improvement of pulmonary function after the post Pilates training Some parameters of the pulmonary function were also improved along with the improved thoracoabdominal mobility so he concluded that Pilates exercise training is used for enhancing the respiratory function.⁸

The third graph shows about the 3 min walk test, the total number of lapses covered by the patient before & after interventions were measured , it is found that the total number of lapses were significantly increased after intervention in both the group as compared to the number of lapses before interventions .This study is supported by Elizabeth Hornsby Bphty et al who conducted a study on the effects of pilates interventions on physical function of children and youth , he concluded that Pilates improve flexibility, strength and postural control and reduce pain in children with musculoskeletal pathology.⁹ From the above discussion it is clear that Pilates and functional & mobility exercise shows a greater impact in children with Down's Syndrome as it strengthen the respiratory muscle, improves the pulmonary and cardiorespiratory parameters & trunk mobility and stability.

CONCLUSION:

It was observed that there is no statistically significant difference on cardiorespiratory parameter i.e PEFR, SPO₂ and 3MWT in Pilates exercising receiving group and in functional & mobility exercise group, so this study concluded that Pilates is as effective as functional & mobility exercise in children with Down's syndrome.

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