Original Article

Effect of Aerobic Exercises and Strengthening Exercises in Improving Functional Mobility in Down Syndrome Population

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How to cite this article: Abinaya K, Prathap suganthirubabu, Vignesh Srivasan et. al. Effect of Aerobic Exercises and Strengthening Exercises in Improving Functional Mobility in Down Syndrome Population. Indian Journal of Physiotherapy and Occupational Therapy / Volume 18, Year 2024.

Abstract

Background: When compared to children without Down syndrome (DS), children with DS exhibit qualitatively different movement patterns and a considerable delay in the development of motor abilities. Due to their difficulty maintaining proper body alignment and aberrant walking patterns, children with DS are more likely to fall. Strengthening and aerobic exercise are part of the Down syndrome therapy programme.

Purpose: To evaluate the effectiveness of aerobic exercises and strengthening exercises in Down Syndrome Population **.**

Methodology: Twenty down syndrome patients were randomly divided into groups A and B. Aerobic exercise was given to ten subjects in group A, and strengthening exercise was given to ten subjects in group B. The Dynamic Gait Index Scale was employed as an outcome measure and was pre-assessed on Day 1. For four weeks of treatment, each group had two sessions per day, followed by a post-assessment of the outcome measures.

Results: Group A experienced an increase in the dynamic gait index scale. The Group A showed improvement in the Dynamic gait index scale after training, which was statistically significant ($p<.01$)

Conclusion: The results obtained from this research were statistically classified and can be concluded that there was a definite and positive effect of strengthening exercise in improving functional mobility in Down syndrome population.

Keywords: Aerobic exercise, Strengthening Exercise, Down Syndrome, Functional mobility and Core stability.

Introduction

Down's syndrome (DS) is a genetic disorder brought on by the presence of all or a portion of an extra 21st chromosome.[1] in 700–1000 live births, this occurs just once.[2] Children with DS show motor dysfunction due to hypotonia, ligamentous laxity, co-contraction of agonist and antagonist muscles, as well as balance and postural issues.[3] Children with DS may experience movement limitations and difficulty maintaining antigravity conditions as a result of these

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deficiencies, which may also contribute to delayed motor developmental milestones.[4]

Children with DS have been found to have balance issues and postural difficulties. Young children with DS show postural control system abnormalities, which may lead to functional balance issues.[5]

Exercise programmes can enhance physical abilities, foster social interaction, and boost health. Improved mobility, balance, coordination, and greater strength and endurance are all physical activities for those with Down syndrome.[6,7] They could consist of balance, cardio, and strengthening activities. Resistance is a component of strengthening exercises like weightlifting or using resistance bands. For instance, lunges, squats, pull-ups, push-ups, and dead lift.[6] Increasing dynamic balance and muscle coordination between the lower and upper limbs, as well as lowering injury risk and muscle imbalances, may be accomplished with the use of core stability. [8,9]Activating deep abdominal muscles, enhancing lumbar spine stability, and enhancing physical function are all benefits of performing core stability exercises on patients. stability has a good impact on performance, lumbar spine stability, pain alleviation, and abdominal muscle activation.[10,11]

Aim

To evaluate the effectiveness of aerobic exercises and strengthening exercises in Down syndrome Population.

Materials and Methods

It was an Experimental Study Conducted on 20 participants from G.V School from Chidambaram using Convenient sampling. The participants were separated into two equal groups based on inclusion criteria. Study was Conducted from October 2022 to July 2023

Inclusion criteria:

- Young individuals with Down syndrome between the ages of 14 and 22
- Who didn't suffer from intellectual difficulty
- Could stand and walk independently

Exclusion criteria:

- An untreated congenital heart problem
- Idiopathic Arthritis
- Hearing and vision problems
- Lower limb musculoskeletal anomalies

Outcome measure:

- DGI Scale

Procedure

Down Syndrome children were recruited from G.V SCHOOL with prior permission of patients having ability to perform & participate in this study. They were explained about the safety and simplicity of procedure and informed consent was obtained. In This Study 10/group was selected based on the inclusion and exclusion criteria. Pre – test was conducted to assess the functional mobility by using Dynamic Gait Index Scale (DGI). The Total number of subjects 20 were divided into 10 subjects for the experimental group (GROUP A), were given Strengthening Exercise. 10 subjects for the conventional group (GROUP B), were given Aerobic Exercise. Then the Treatment was given to the patient for 4 weeks, 2 sessions in a day and completed the treatment then assessed the post-test.

Group A: The experimental group was given Strengthening exercise of 2 sets each day and each set consists of 10 repetitions. For four consecutive weeks, this treatment method was used five days a week. Patient was given rest after each session. After 4 weeks post-test values for DGI scale were taken down, tabulated and then statistically evaluated for results.

First Week:

Core Stability Exercises

- Laying down and performing three sets of 20 reps of contracting your abdominal muscles
- Spending three sets of 20 repetitions on your back while squeezing your abs.
- Squats with abdominal contractions (three sets of 20 reps each).
- three sets of 20 repetitions each of contracting the abdominal muscles while lying on one side with the other leg bent at the knee and pressed against the abdomen.
- For each of the six repetitions and the ten-second wait, perform a side-by-side bridge.

- Pulling the limbs forward while supine and tightening the abdominal muscles while maintaining close contact with the floor (3 sets of 20 reps each).

Second week:

- Arm Curl and Triceps pushdown
- (Three sets of 10 repetitions)
- Leg Curl and leg press (three set
- of 10 repetitions)
- Leg lifting in side-lying, prone
- and supine positions.
- chest press

Third Week:

- Leg raised and dragged outward and backward while in the squat posture (three sets of each leg with 10 reps)
- push-ups on the wall (three sets of 10 repetitions)
- curl –ups, (three sets of 10 repetitions)

Fourth Week:

- Bearing weights in your hands while performing the aforementioned exercise (3 sets of 15 repetitions each).
- Using Cuff weights, flex and abduct the shoulders.
- six times for each side of the body while lying on the side with the lifted leg, followed by a 10-second pause.

Group B: The aerobic exercise programme for group B lasted 30 minutes, five days week, for four weeks. Walking under supervision with a moderate effort level was the exercise's goal. Group B carried on as usual and did not engage in any specific activity. It is essential to ensure that the activity is done at a comfortable pace and intensity. In addition, it is essential to start slowly and gradually increase the intensity and duration of the activity over time.

Aerobic exercise:

Walking – 30 minutes

Data Analysis

Fig 1: Group A and Group B Pre-test and Post test values for Down syndrome

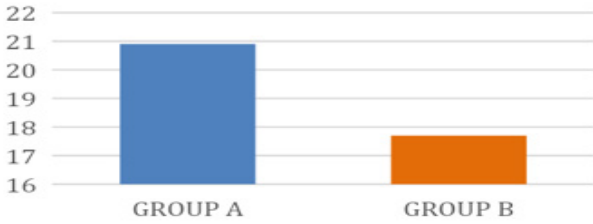

Fig 2: Group A and Group B Post test values for Down syndrome

Result

Statistical analysis of quantitative data showed statistically significant differences not Only in GROUP A but also in GROUP B. The GROUP A DGI post-test mean value was 20.90(+0.88), whereas the GROUP B was 17.70 (+0.82). This indicates that the GROUP A DGI score was significantly higher than the GROUP B, with a $P< 0.0001$.

Statistical analysis of the DGI post-test results revealed that the GROUP A AND GROUP B showed similar statistically significant differences. As a result, GROUP A exceeds GROUP B statistically.

Discussion

The objective of the current study is to examine the effects of strengthening training and aerobic exercise on functional mobility in individuals with Down syndrome. For four weeks, this comparison is demonstrated.

Dynamic Gait Index Scale was used to evaluate the outcomes both during and after therapy. Strengthening exercise had significantly better effects

than aerobic exercise. When the responses were compared between two groups the result showed a significant difference in strengthening groups than in aerobic exercise. When the response was compared between two groups the result showed a significant difference in strengthening group than in aerobic exercise.

In the Aerobic group the pre-test values of DGI were 10.70 (+ 1.95). After treating the subject with strengthening exercise, the mean value of DGI is increased to 17.70 (+0.82) which shows statistically significant difference with the groups.

In the strengthening group, the pre-test values of DGI were 10.5(+1.58). After treating the subject with strengthening exercise, the mean value of DGI is increased to 21.10 (+0.88) which shows statistically significant difference with the groups.

Based on the statistical analysis, both groups showed improvements in DGI. However, subjects in the strengthening group who received strengthening exercise showed better improvement in DGI than the subjects in the aerobic exercise who received aerobic exercise.

An early study by Sobhy M. Aly1 and Asmaa A. Abonour 2016. Children with Down syndrome who have balance issues can benefit from core stability training to improve their balance and lower their chance of falling and getting hurt, which will enhance their quality of life. Training in core stability can be utilised to enhance performance and reduce injuries. Core stability training has a significant impact because it enhances the neuromuscular system's functionality, which leads to optimal lumbar-pelvic-hip chain mobility, good acceleration and deceleration, appropriate muscular balance, proximal stability, and good function These will lead to the muscles in the lower extremities that control movement becoming stronger. Exercises for core stability should be included in the rehabilitation plan for kids with Down syndrome. [12]

An early study by Adela Castaneda et at in this study he did a study on aerobic training and resistance exercise in down syndrome. Together, these results show that weight training and aerobic exercise programmes are useful exercise regimens for adults and children with DS.[13]

An early study by Sahel Hemati Garekani 2020The results. Together, these results show that weight training and aerobic exercise programmes are useful exercise regimens for adults and children with DS.[14]

An early study by Eduardo Fernandes da Fonseca, 2022.) focused on the methodology, implementation, and safety of this training modality, effects of resistance training (RT) for people with Down syndrome (DS) The author suggests using RT as well as combining it with various forms of exercise (such as aerobic, balance, plyometrics, and isometrics), taking into account the volume and intensity, as well as the duration of training, and the type of exercise used (such as machine exercise, bodyweight exercises, and/or free weights). [15]

Conclusion

According to the research, Strengthening Exercises outperforms aerobic exercise in terms of enhancing the functional mobility in the down syndrome population. The outcomes of this study were statistically significant, and it is reasonable to create the conclusion that strengthening exercise significantly and effectively improved functional mobility in Down Syndrome.

Ethical Clearance: Taken from the Institutional ethical committee. ISRB number - 03/005/2022/ ISRB/SR/SCPT

Funding: Self

Conflict of interest: No conflict of interest during this research.

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