Effects of Circuit Training Program on Quality of Life of Children with Hemophilia

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Abstract

Introduction: Circuit trainingaddresses both the components of exercise i.e. strength and aerobic which can be administered to participants in a playful manner. As the large number of children will have to gather at one place for the intervention, so it will be beneficial for the therapist also to conduct the session by incorporating them into small groups. Very few have shown the effects of circuit training in hemophilia Therefore it becomes necessary to provide an exercise regimen to children which will be interesting to perform in order to improve their general fitness level.

Methodology: Forty nine participants were selected and screened and were allocated into 7 groups. The intervention was given for 4 weeks period, once a day for 7min with 50 sec for exercise and 10 sec to move from one station to the next. Pre and Post parameters were assessed forVAS for fatigue and Subjective Exercise Experience Scale.

Results: Data was analyzed using Graph-Pad InStat software version-trial version 3.03. The statistical measures utilized were mean, standard deviation and test of significance such as Paired't' test to analyze the data. The results were concluded to be statistically significant with $p < 0.05$ and highly significant with $p < 0.01$.

Conclusion: The present study concludes that the circuit training is effective in hemophilic children as its multipronged approach improves various body systems.

Key words: *Haemophilia, Circuit training, Fatigue, Group Exercises, Physiotherapy*

Introduction

The existence of life-long bleeding disorders and their familial occurrence was noted early by Alsaharavius during tenth century.[1]Bleeding disorders are due to either defects in the coagulation mechanism, the blood platelets, vitamin K deficiency or deficiency of clotting factor. Haemophilia is one of the bleeding disorders, has been recognized as a clinical entity since Biblical times.[2]Hemophilia is also known as 'the royal disease' as one famous carrier was Queen Victoria, Queen of England and Ireland, India who transmitted the condition to three of her children.[3]

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Haemophilia has been recognized all over the world, an available estimate range for incidence of haemophilia is from 1 in 20,000 to as high as 1 in 10,000 persons.[4,5] It is an X-linked inherited recessive bleeding disorder that is characterized by a deficiency of clotting factor.[6]Clotting factors are proteins in the blood that controls bleeding.[7]Haemophilia is traditionally classified as 'mild', 'moderate', or 'severe', depending on the level of clotting factor available in the body compared with that found in the general population.[8] Patients with severe haemophilia have <1% clotting factor activity, moderately affected patients have 1-5% and mildly affected patients have 6-40%.[9]

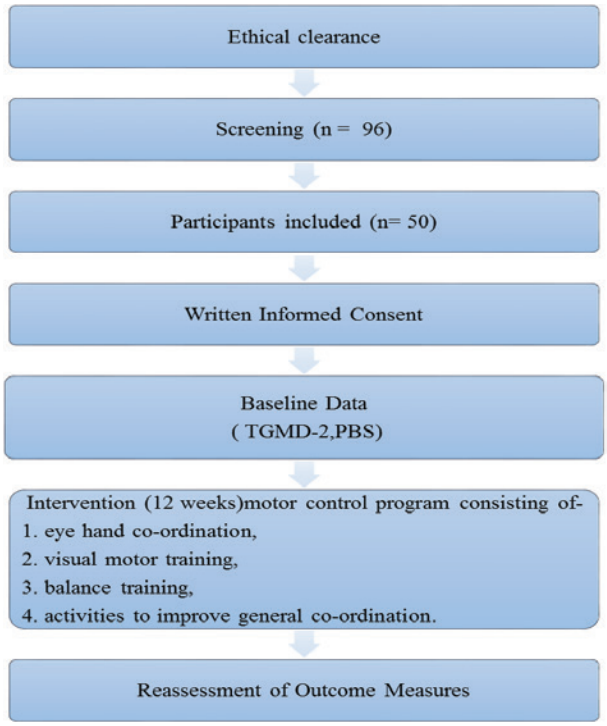
Wound bleeding is the characteristic symptoms of all haemophiliacs. It is usually slow and persists for days to weeks. Bleeding into joint may be spontaneous or induced by minor trauma. The earliest joint hemorrhages appear most commonly in knee and ankle, because of the lack of stability of these joints as the toddler assumes an upright posture. Other joints that may be

involved are the elbows, hips, wrists, shoulder and small joints of hand and feet.[10] Prophylactic treatment with the use of coagulation factor is efficient in reducing bleeding episodes in haemophilic children.[11]Frequent musculoskeletal bleedings ongoing in persons with haemophilia result in limitations and deficiencies of the musculoskeletal system, affecting the performance of daily living activities.[12] Clinical manifestations may include pain, muscle atrophy, abnormal gait, haemarthrosis, reduced joint range of motion or even the development of degenerative alterations in joint. The damage resulting from haemarthrosis may cause periods of joint immobilization, tendon weakness, stiffness and joint destruction with a higher risk of fractures and osteoporosis.[3]

Besides pharmacological treatment physiotherapy plays an important role in rehabilitation of haemophilics.[13] Physical fitness is generally defined as '' the ability to perform daily tasks without fatigue''.[14] It is an umbrella term incorporating the characteristics of cardiovascular fitness, body compositions, flexibility, muscular strength and endurance.[15]It is important for the individuals with haemophilia because their disabling condition itself may interfere with their activities like their ability to move efficiently.[16] ,[17]Benefits of regular physical exercise forhaemophilic patients are numerous and cover various physical and psychosocial aspects. Physical benefits include improvement in range of motion of the joints, muscular strength protecting joint from injury. The psychosocial benefits include higher self-esteem and socialization which leads to a better quality of life.[18] However physical activity has been linked to improving psychological conditions, such as limiting emotional distress and enhancing self□esteem.Therefore selecting appropriate exercises and fitness activities that are safe for people with hemophilia is essential.[19]

Circuit training (CT) is a type of exercise which involves exercises to perform in a sequence in a circular manner and designed to improve cardiovascular fitness, muscular strength and endurance. It comprises both forms of exercises i.e. aerobic and resistance or strength training.[20]

Circuit Training is a fun, cost and time effective way and able to be administered to large groups of individuals at the same time, while still being effective. There is some evidence to suggest that Circuit Training leads to positive changes in body composition, which also improves motor control and fundamental movement abilities. Development of such abilities at a young age may be beneficial in the long term. However, few studies have assessed the effects of Circuit Training on both physical fitness and movement abilities.[21] Thus, the aim of the present study will be to determine the effectiveness of CT program on Fatigue level and Psychological well-being in children with haemophilia.



Procedure:

Forty nine participants were selected for the study. They were randomly allocated into 7 groups. Details about the study and intervention were explained to the participants and written informed consent was obtained. Demographic details of each participant were noted including clotting factor level. Participants were assessed pre and post data forVisual Analogue Scale for fatigue and Subjective Exercise Experience Scale.

The intervention was given once a day for 4 weeks period, once a day, for 7min with 50 sec for exercise and 10 sec to move from one station to the next in the form of Circuit Training. A demonstration was given to the participants to make them understand about how to perform the exercises and how to move in the Circuit. Exercises were done with music for having effective and enjoyable. At a time only one group was given Circuit Training followed by other in a circular sequence.Each participant in the circle performed respective exercise recommended to them at that particular station.

Exercises for respective joints were the followings: [22]

Exercise for Shoulder joint: Keep both the hands on shoulders of the same side. Move the shoulders in outward direction in a circular way simultaneously.

Exercise for Elbow joint: Stand facing the wall. Place hands flat on wall with arms straight. Lean body towards wall allowing elbow to bend. Return to upright position by pushing with arms and straightening the elbow.

Exercise for wrist joint: Place palm of hands together with finger straight (in a prayer position) while keeping the hands pressed flat together move both the wrists in extension alternately.

Exercise for Hip joint: Stand by facing the wall. Place both the hands on the wall for support. Extend the hip by keeping the knee straight. Perform the same for both the hips alternately.

Exercise for Knee joint: Stand with the weight evenly distributed on both feet. Squat down partway keeping weight distributed evenly on both feet. Do not bend knees far enough to cause pain. Hold for several seconds. Return to upright position.

Exercise for Ankle joint: Stand with both legs adequately wide apart. Place both palms of hands on wall for support. Do the dorsi-flexion and plantar-flexion alternately.

Exercise for Trunk: Keep both the hands on low back for the support and gently extend as much as possible. Then come back to upright position.

Data Analysis:

Data was analyzed using Graph-PadInstatsoftware trial version 3.03. It was entered into an excel spread sheet, tabulated and subjected to statistical analysis. The statistical measures utilized were mean, standard deviation (SD) and test of significance such as Paired‘t’ test to analyze the data. Paired‘t’ test was used to compare the differences of scores on pre and post intervention within a single group. The results were concluded to be statistically significant with $p < 0.05$ and highly significant with $p < 0.01$.

Fatigue Score:

The rates of perceived fatigue were assessed by VAS. The rating of fatigue scores were recorded on the scale.Paired‘t’ test was used to compare score within the group.The pre-intervention average score of fatigue score in participants was 1.40 and post-intervention was 1.87. There was highly significant increment in fatigue score for the group after intervention.

Table 1: Comparison of pre and post intervention score of Fatigue

	Mean + SD	Mean + SD	Mean difference	‘t’ value	P value	Inference
Fatigue Score	1.40 + 1.17	1.87 + 1.50	0.673±0.74	3.683	0.006	Highly significant

Subjective Exercise Experience Scale (SEES): Paired‘t’ test was used to compare score within the group.The pre-intervention average score of Positive wellbeing in participants was 14.32 and post-intervention was 16.97.There was highly significant increment in Positive wellbeing score for the group after intervention.

The pre-intervention average score of Psychological Distress in participants was 7.14 and post-intervention was 4.83.There was highly significant reduction in Psychological distress for the group after intervention.

The pre-intervention average score of fatigue was 5.51 and post-intervention was 5.10.There was highly increment in positive wellbeing component as well as significant reduction Psychological distress component of SEES after intervention, whereas Fatigue component found to be significant.

Table 2: Comparison of pre and post intervention scores of SEES components

SEES Components	PRE	POST	Mean Difference	't' value	'p' value	Inference
	Mean + SD	Mean + SD				
Positive well being	14.32 + 2.42	16.97 + 2.17	2.65±0.96	19.15	0.001	Highly significant
Psychological Distress	7.14 + 1.39	4.83 + 1.28	2.30±0.821	19.64	0.001	Highly significant
Fatigue	5.51 + 1.17	5.10 + 1.18	0.93±0.59	2.74	0.08	Significant

Discussion

The study was done to evaluate the effects of circuit training in Haemophilic Children. In children with Haemophilia reduced muscle strength and cardiovascular endurance are main contributing factors to have poor fitness level and reduced psychological wellbeing compared to typically developing peer which results because of fear of getting bleed.

Circuit Training showed good improvement in Positive wellbeing, reduced psychological distress and fatigue to some extent. Circuit training being multipronged in its approach addresses the improvement in various systems of body and even psychological aspects.CT program was specifically designed to provide variation and stimulation in order to maximally engage children and to ensure adherence and enjoyment, whilst achieving positive changes in health and fitness outcome measures. The effects seen in this study were due to gradual effects of exercise which imposes demands on the different systems of the body such as enhancement of oxygen delivery systems, expanded plasma volume, maximum minute ventilation and increased cellular enzyme activity.[23, 24]

Most of the haemophilic children are sedentary and having reduced physical activity. Therefore fatigue had set in early. In the present study there was significant difference fatigue score.

A pilot study was done to determine the effect of an acute bout of exercise on the subjective exercise experience of Vietnam Veterans, and to determine which exercise intervention results in the most positive acute outcome. Specifically, this study included the use of a combination of traditional exercise modes and innovative exercise.Overall this pilot study has demonstrated that an acute bout of exercise elicits improved positive wellbeing and reduced psychological distress, and therefore warrants further research with a larger cohort to determine which exercise intervention results in the most beneficial subjective experience. The identification of specific exercise interventions that elicit acute positive exercise experiences has important implications for long-term exercise adherence in at-risk populations.

In the present study there were significant differences in the components of Subjective Exercise Experience Scale (SEES) with increase in positive wellbeing. Psychological distress showed reduction in score after intervention, whereas fatigue component also showed significant difference.

A study has proved that a school□based CT program had beneficial effects on a range of fitness measures. These movement skills arehelpful in ensuring good general posture, and effective movement in a variety of physical activities, sports and game play. For these reasons, and given its low cost and suitability for large groups, CT maybe a useful exercise method to adopt in schools. This is in accordance with the research studies, CT program on the health, fitness, physical activity levels, and movement competency in young children.[25, 26]

An overview of literature review concluded that aerobic and resistant training intervention elicits some benefits for physical fitness and blood coagulation mechanisms, suggesting the application of physical training as a non-pharmacological treatment in association with conventional treatment. Adequate and periodized resistance training considering the disease severity, accompanied by physical education professionals could improve muscle strength, balance and proprioception. Aerobic training could reduces the risks of obesity and several metabolic and cardiovascular diseases. Another review article concluded important evidence on the recommendation of physical exercise and sport in haemophilia, the consensus on its suitability for the physical and social wellbeing of the patients and the need to increase scientific works in this respect.[27]

Researchers analyzed the current state of management of haemophilia and to suggest a comprehensive concept of rational and effective rehabilitation of children with haemophilia. The study concluded that current rehabilitation care is of good quality and necessary for effective lifelong therapy of haemophilia.[28]

Thus many researchers have proved that for achieving general fitness and maintaining psychological wellbeing in haemophilic children, exercise regimen and physical activities contribute major role which occurs due to physiological changes in various systems of body in order to prepare the body to control the new imposed demands while performing the exercise and physical activities.

Conclusion

The present study concludes that the circuit training is effective in haemophilic children as its multipronged approach improves various body systems.

Ethical Clearance- Taken from Krishna Institute of Medical Science Ethical committee

Source of Funding- Self

Conflict of Interest - nil.

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