"EFFECTIVENESS OF CONVENTIONAL BALANCE TRAINING VERSUS CAWTHORNE-COOKSEY EXERCISES TO IMPROVE BALANCE IN SPECIALLY ABLED ATHLETES"

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ABSTRACT

Abstract

Background: Balance is an important attribute for controlling movements, ensuring posture and carrying out functional activities. It is extremely important for sportsmen doing active physical exercise. People with disabilities can have some difficulty in maintaining posture due to motor coordination and sensory integration differences. There are different methods of balance training. Some approaches focus on improving stability by using special activities for balance maintenance, whereas Cawthorne–Cooksey exercises involve movements of the head, eyes and body, stimulating vestibular function. Thus, both methods may help to improve balance and increase functionality of people with disabilities.Therefore, this research aims to compare the effectiveness of conventional balance training and Cawthorne–Cooksey exercises in improving balance of specially abled athletes.

Procedure: A total of 54 specially abled athletes aged 10–18 years participated in the study. They were chosen from Swayam School for Special Children, Kolhapur, and were divided into two groups with 27 participants in each group. The first group received conventional balance training (Group A), and the second group participated in Cawthorne–Cooksey exercises (Group B). Both treatments were given 30 minutes per session, 3 times a week, and lasted for 4 weeks. Balance was assessed before and after the implementation of respective treatments using the outcome measure given in the study protocol. Pre- and post-intervention results of the participants were collected in order to compare the efficacy of these treatments for improvement of balance.

Result: The results showed that Group A demonstrated the significant improvement of the balance skills after the completion of the training sessions.Group B also showed improvement in balance as a result of Cawthorne–Cooksey exercises.Overall, the effects of conventional balance training and Cawthorne–Cooksey exercises did not differ in terms of their effectiveness in improving balance.There was no statistical significant difference between the IQ scores in the both groups.

Conclusion: Conventional balance training in physiotherapy is superior to cawthorne-cooksey exercises in impoving balance in specially abled athletes. It also showed result faster than the other group. Also there was no significant difference in the IQ scores of both group members.

Keyword's: Coventional Balance training, Cawthorne-cooksey exercises. Physiotherapy, Specially abled children, Athletes, Comparison.

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INTRODUCTION

Intellectual disability (ID) is a neurodevelopmental disorder characterized by limitations in intellectual functioning and adaptive behavior. These limitations may affect learning, communication, decision-making, and participation in daily activities, including physical activity and sports. However, appropriate exercise and sports programmes can be organized for individuals with ID through adequate supervision, guidance, and training.

Balance is an essential component of postural control that enables individuals to maintain stability while standing, walking, changing positions, and performing sports activities. It involves maintaining the body's centre of mass within the limits of its base of support during static and dynamic movements.[4] Postural control depends on the integration of visual, vestibular, and somatosensory information, along with appropriate motor responses generated by the central nervous system.[5,6] Balance is particularly important for athletes because sports require

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coordinated movements, changes in direction, reaching, jumping, landing, and rapid responses to unexpected situations.[7]

Individuals with intellectual disabilities may experience difficulties with postural stability, motor coordination, gait, and body movement regulation, potentially affecting their safety and participation in recreational and competitive activities.[8] These limitations may emerge during childhood and contribute to mobility difficulties.[8] Therefore, assessing balance and providing appropriate training are important for improving functional performance and participation in sports.

Sensory integration also plays an important role in balance control. Studies involving young individuals with intellectual and developmental disabilities have reported impairments in vestibulo-ocular responses and difficulties performing certain balance activities. Research involving young adults with Down syndrome has highlighted the importance of evaluating static postural control to understand balance limitations.[10] Furthermore, studies involving young athletes with intellectual disabilities participating in the Special Olympics have demonstrated the feasibility and importance of vestibular screening. These findings suggest that balance difficulties may arise from multiple factors, including sensory integration, motor control, and individual functional abilities, which should be considered when planning rehabilitation.

Sports participation provides children with opportunities to develop motor skills, coordination, physical fitness, and self-confidence. A study comparing athletes with intellectual disabilities and sedentary individuals identified differences in static postural balance under specific testing conditions, suggesting an association between sports participation and balance performance.[12] However, sports participation alone may not adequately address all balance limitations, highlighting the potential role of physiotherapy interventions.

Conventional balance training is a physiotherapy approach that aims to improve postural stability and coordination through structured exercises. These may include standing on stable or unstable surfaces, weight shifting, tandem walking, reaching activities, balance-board exercises, and static and dynamic balance tasks.[6,7] Exercise difficulty can be progressively adjusted according to individual abilities and safety requirements. These activities encourage appropriate postural strategies, control of the centre of gravity, and improved coordination during functional movements. A systematic review and meta-analysis reported that exercise programmes can improve balance in young individuals with intellectual disabilities, although outcomes vary according to the type of intervention.[14] Evidence also suggests that regular physical activity can improve balance among children and adolescents with intellectual disabilities.[15] According to the WHO, physical activity is important for promoting health and well-being among individuals with disabilities.[13] Therefore, structured and supervised balance training may support safer movement and greater participation in daily and sporting activities.

Another rehabilitation approach is the Cawthorne–Cooksey exercise programme, which was initially developed for individuals with vestibular disorders.[20,21] It includes eye, head, and body movements performed in different positions, progressing from lying or sitting to standing, bending, reaching, and walking activities.[22,23] These exercises aim to promote vestibular adaptation and habituation while improving coordination among the visual, vestibular, and somatosensory systems. Vestibular rehabilitation is an established exercise-based approach for addressing vestibular hypofunction and impaired postural stability.[23,24] A systematic review reported benefits of Cawthorne–Cooksey exercises for vestibular symptoms but did not establish their superiority over other vestibular rehabilitation interventions.[25] Other studies have also compared vestibular rehabilitation exercises with alternative interventions for vestibular disorders.[26,27] However, much of the existing evidence concerns patients with vestibular disorders, indicating the need for further research involving specially abled athletes.

The Paediatric Balance Scale (PBS) is a functional balance assessment tool developed for school-aged children and based on a modified version of the Berg Balance Scale. It comprises 14 items, each scored from 0 to 4, giving a maximum possible score of 56.[16] Its measurement properties, including validity and responsiveness, have been examined in children with motor disorders.[17] Studies involving typically developing children have also supported its use for assessing functional balance in paediatric populations.[18] The Berg Balance Scale remains an important instrument for standardized balance assessment.[19] In the present study, the PBS is used to evaluate changes in functional balance following the interventions.

Although conventional balance training and Cawthorne–Cooksey exercises both address postural control, their primary focuses differ. Conventional balance training emphasizes static and dynamic stability through functional balance activities, whereas Cawthorne–Cooksey exercises emphasize progressive eye, head, and trunk movements associated with vestibular rehabilitation. Although both approaches may improve balance, their comparative effectiveness

among specially abled athletes requires further investigation.

Therefore, the present study aims to compare the effectiveness of conventional balance training and Cawthorne–Cooksey exercises in improving balance among specially abled athletes aged 10–18 years. Balance will be assessed using the Paediatric Balance Scale before and after the interventions. Comparing the changes in scores will help determine which intervention produces greater improvement and contribute to the evidence supporting physiotherapy practice for specially abled athletes.

MATERIAL AND METHODOLOGY

A Experimental Comparative Study was conducted on Specially Abled Athletes fulfilling the inclusion and exclusion criteria.at Swayam School for Special Children, Kolhapur. **Sample Size was** 54. Group A: 27 participants receiving conventional balance training. Group B: 27 participants receiving Cawthorne–Cooksey exercises. The study was conducted over a period of 6 months. All the participants were slecte according to the exclusion and inclusion criteria. **Intervention Protocol –** Each group received its respective intervention for 30 minutes per session, 3 days per week, for 4 weeks.

MATERIAL

Paediatric Balance Scale, Foam mat, Balance board, Informed consent form, data collection sheet.

Inclusion Criteria: Participants aged 10–18 years, participants with an IQ below 70, athletes with a minimum of 2 years of experience.

Exclusion Criteria: Participants with an IQ greater than 70, non-cooperative participants. participants with autism, as specified in the synopsis.

PROCEDURE

Ethical clearance isachieved from the institution ethical committee. Specially abled athelete are included after consent of own and parents. subjects were divided into two group.i.e. Group **A** and Group **B** according to inclusion criteria and exclusion criteria and explain about the study.
The procedure was explained to the subjects. A written consent was taken from subjects who are willing to participate.

Group A – Conventional Balance Training

Group A consisted of 27 specially abled athletes. Participants underwent conventional balance training, including single-leg standing, tandem stance, maintaining balance while standing, balance-board exercises, tandem walking, and reaching activities. Each session lasted 30 minutes and was conducted three days per week for four weeks.

Group B – Cawthorne–Cooksey Exercises,

Group B consisted of 27 specially abled athletes. Participants performed Cawthorne–Cooksey exercises involving progressive eye movements, head movements, and trunk movements to challenge balance and coordination. The exercises progressed according to the prescribed protocol. Each session lasted 30 minutes and was conducted three days per week for four weeks.

Assessment: Both groups were assessed using the Paediatric Balance Scale before and after the intervention. Pre- and post-intervention scores were compared to evaluate changes in balance and determine the comparative effectiveness of both interventions.

GROUP A:
CONVENTIONAL BALANCE TRAINING

Group A consisted of 27 specially abled athletes who received conventional balance training for 30 minutes per session, three days per week, for four weeks. The training focused on improving static balance, dynamic balance, postural stability, and coordination through the following exercises.

Single-Leg Standing: Participants maintained an upright standing position on one leg while attempting to maintain stability. The exercise challenges postural control and weight-bearing balance.

Tandem Stance: Participants stood with one foot placed directly in front of the other in a heel-to-toe position. They attempted to maintain a stable posture while keeping their body aligned.

Straight-Leg Standing: Participants maintained an upright standing position with their legs straight and body balanced over the base of support. This activity focused on postural alignment and static stability.

Balance-Board Training: Participants performed balance activities using a balance board. They attempted to maintain stability while responding to the movement of the board, challenging postural adjustments and coordination.

Tandem Walking: Participants walked in a straight line by placing one foot directly in front of the other. This activity challenged dynamic balance and controlled movement during walking.

Reach-Out Exercises: Participants reached forward or in different directions while maintaining a stable standing posture. The activity challenged the ability to control body movement while changing the position of the upper limbs.

The exercises were performed according to participants' abilities, with appropriate supervision and safety precautions. The overall objective was to improve balance control and functional stability. The Paediatric Balance Scale was used before and

after the intervention to evaluate changes in balance performance.

GROUP B: CAWTHORNE–COOKSEY EXERCISES

Group B consisted of 27 specially abled athletes who received Cawthorne–Cooksey exercises for 30 minutes per session, three days per week, for four weeks. This programme involved progressive eye, head, and trunk movements intended to challenge coordination and balance through vestibular rehabilitation exercises.

Eye Movements: Participants performed controlled eye movements, including looking upward, downward, and from side to side. These movements were intended to practise visual tracking and eye coordination.

Head Rotation: Participants turned their heads slowly from left to right and returned to the central position. The movement was performed with controlled posture to challenge coordination between head movement and visual orientation.

Head Flexion and Extension: Participants moved their heads upward and downward in a controlled manner. This activity introduced movement in the vertical plane and challenged coordination during head movement.

Head Movements with Lateral Tilt: Participants practised head movements while the head was tilted toward the right or left, as appropriate to the prescribed exercise. These movements introduced additional variations in head positioning.

Trunk Movements: Participants performed prescribed trunk movements to challenge postural control and coordination during changes in body position. Movements were performed in a controlled manner according to individual ability.

The programme emphasized graded progression and adaptation through repeated practice of the prescribed movements. Exercises were conducted with appropriate supervision and safety precautions. The total intervention duration was four weeks, with each session lasting 30 minutes. The Paediatric Balance Scale was administered before and after the intervention to evaluate changes in balance performance and compare outcomes with Group A.

RESULT

The results show that traditional exercises and Cawthorne–Cooksey exercises helped to improve the balance of specially-abled athletes. Conventional training improved the balance of athletes in Group A. The improvement in the balance of athletes in Group B occurred after Cawthorne–Cooksey exercises were completed. The post-intervention balance of both groups suggests that conventional training was more successful compared to Cawthorne–Cooksey exercises.

GENDER DISTRIBUTION–

Table 1A presents the**Group A**-gender distribution of the total participants. Among the 27 - participants, 17 were male and 10 were female.
Table 1B presents the **Group B** – gender distribution of the total participants. Among the 27 - participants, 19 were male and 8 were female.

Gender	Frequency	Percentage
Female	18	33.30%
Male	36	66.70%
Total	**54**	**100.00%**

Table No.1 Gender distribution

The study included a total of 54 specially abled athletes.

Out of the total participants, 18 were females, accounting for 33.30% of the population.

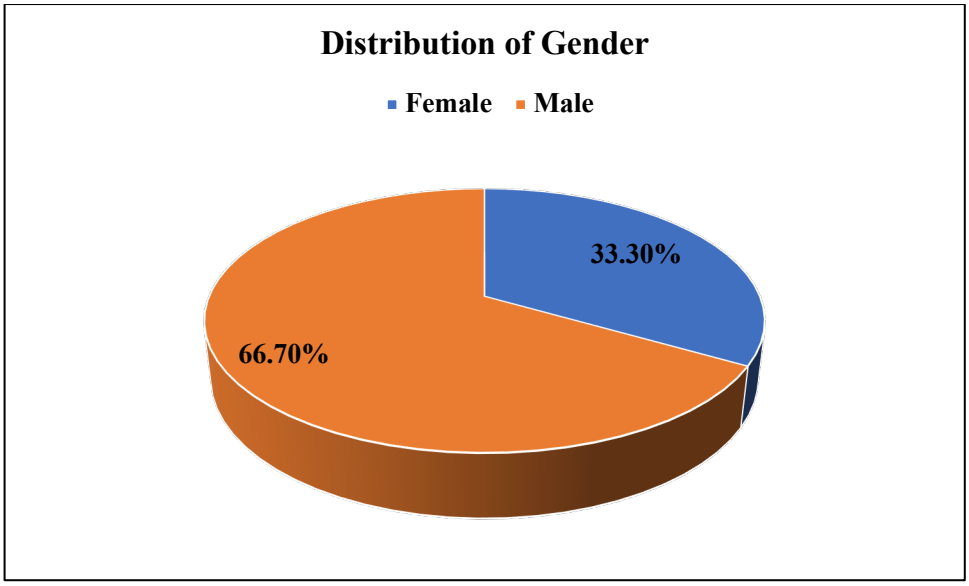
A total of 36 participants were males, representing 66.70% of the population.

The results indicate that male participants formed the majority of the study population.

Female participants constituted approximately one-third of the total sample.

The number of male participants was higher than the number of female participants.

Overall, the gender distribution shows greater male participation in the study.



Graph No.1 Gender distribution

Pre and Post values of PBS for group A

Parameter	Assessment Period	Mean	Std. Deviation	p-value
Paediatric Balance Scale Score	Pre	36.70	4.34	<0.001*
	Post	43.67	5.53	

The Paediatric Balance Scale was used to assess balance in Group A before and after conventional balance training. The pre-intervention assessment showed a moderate baseline balance score among the participants. Following the intervention, the mean balance score increased considerably. The improvement indicates better functional balance performance after conventional balance training. The mean score increased by 6.97 points from pre-intervention to post-intervention. The reported p-value of less than 0.001 indicates a statistically significant improvement. These findings suggest that conventional balance training was effective in improving balance among specially abled athletes in Group A.

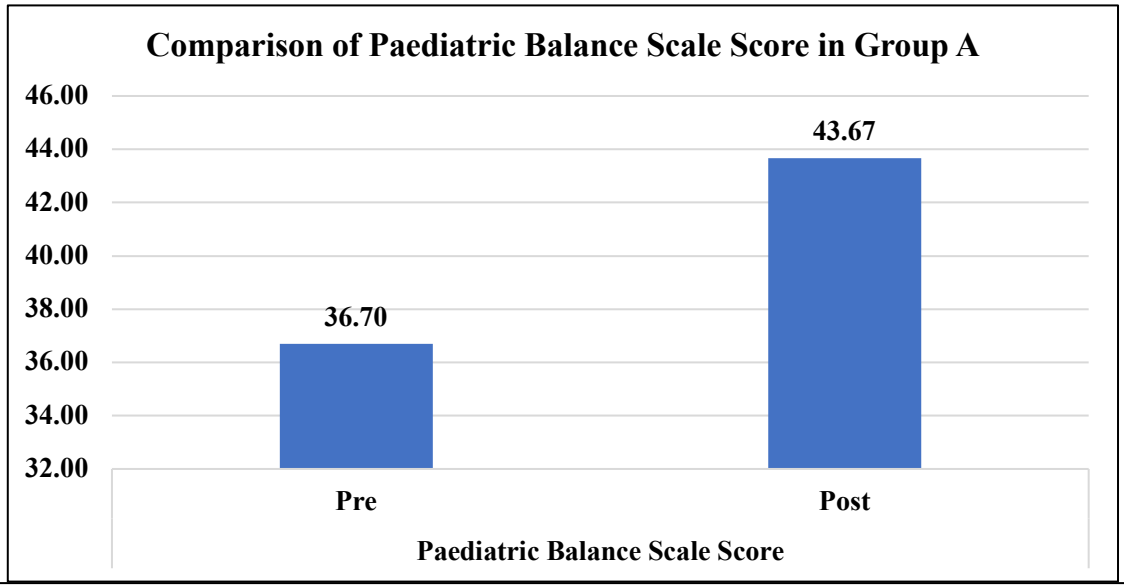


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Table No. 2 Pre-Post Intervention of PBS in Group A
C. Pre and Post values of PBS for group B

Parameter	Assessment Period	Mean	Std. Deviation	p-value
Paediatric Balance Scale Score	Pre	36.78	4.67	<0.001*
	Post	38.41	5.00	

The Paediatric Balance Scale was used to assess balance in Group B before and after Cawthorne–Cooksey exercises. The pre-intervention assessment showed the participants' baseline balance performance. Following the intervention, the mean balance score increased from the initial assessment. The improvement indicates better functional balance performance after completing the exercise programme. The mean balance score increased by 1.63 points from pre-intervention to post-intervention. The reported p-value of less than 0.001 indicates a statistically significant improvement. These findings suggest that Cawthorne–Cooksey exercises were effective in improving balance among specially abled athletes in Group B.

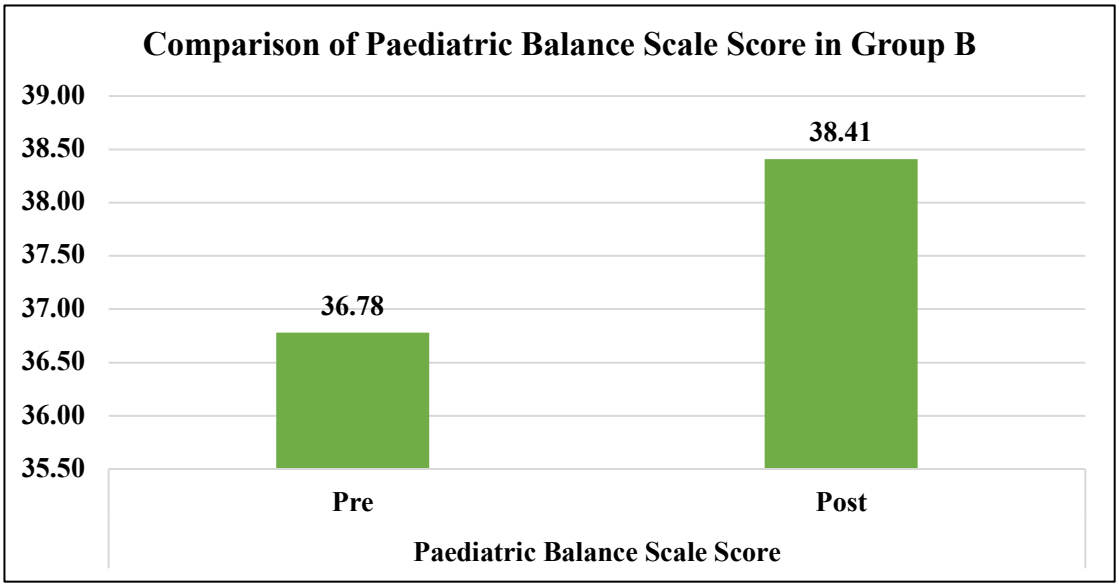

Table No. 3 Pre-Post Intervention of PBS in Group B

Group Comparison				
	Group	Mean	Std. Deviation	p-value
IQ Score	A	53.74	9.03	0.188
	B	57.22	10.11	
Paediatric Balance Scale Score	A	43.67	5.53	<0.001*
	B	38.41	5.00	

The post-intervention Paediatric Balance Scale scores were compared between Group A and Group B. Group A, which received conventional balance training, demonstrated a higher mean balance score than Group B. Group B received Cawthorne–Cooksey exercises and showed a comparatively lower final balance score. The difference between the groups' mean scores was 5.26 points. The

reported p-value of less than 0.001 indicates a statistically significant difference between the groups. These findings suggest that Group A achieved better balance performance at the end of the intervention. Therefore, conventional balance training appeared more effective than Cawthorne–Cooksey exercises in terms of final balance scores. However, comparing pre-to-post changes between groups would provide a stronger assessment of the difference in treatment effectiveness.

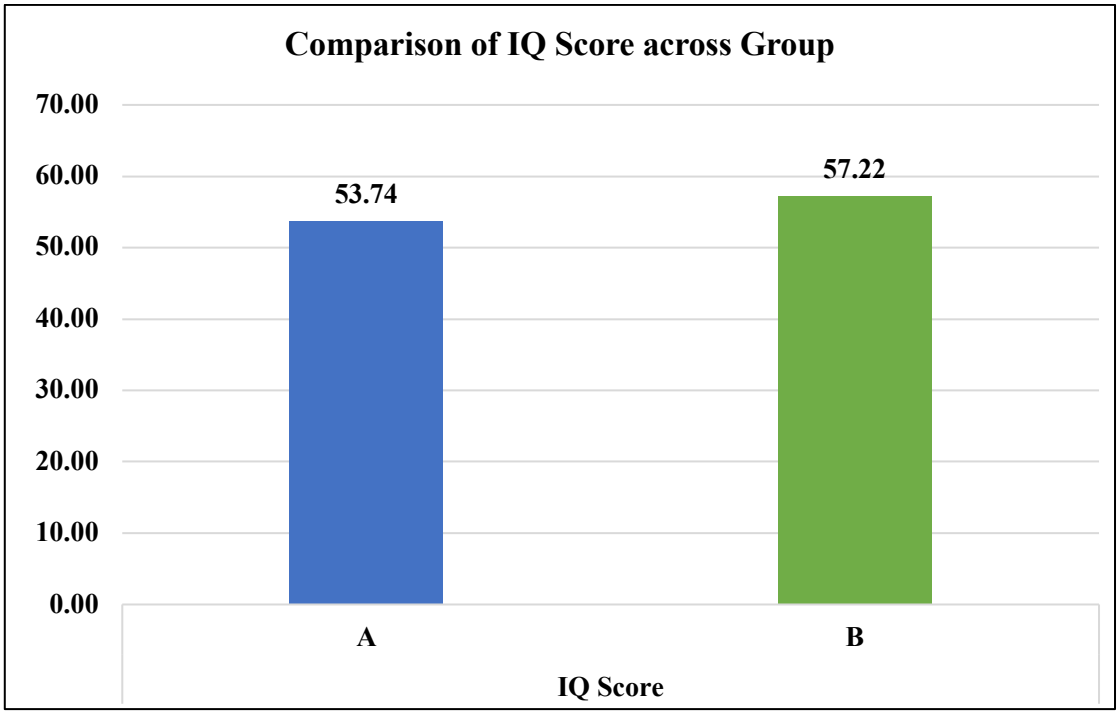

Table 4: Comparison of IQ Score across Group

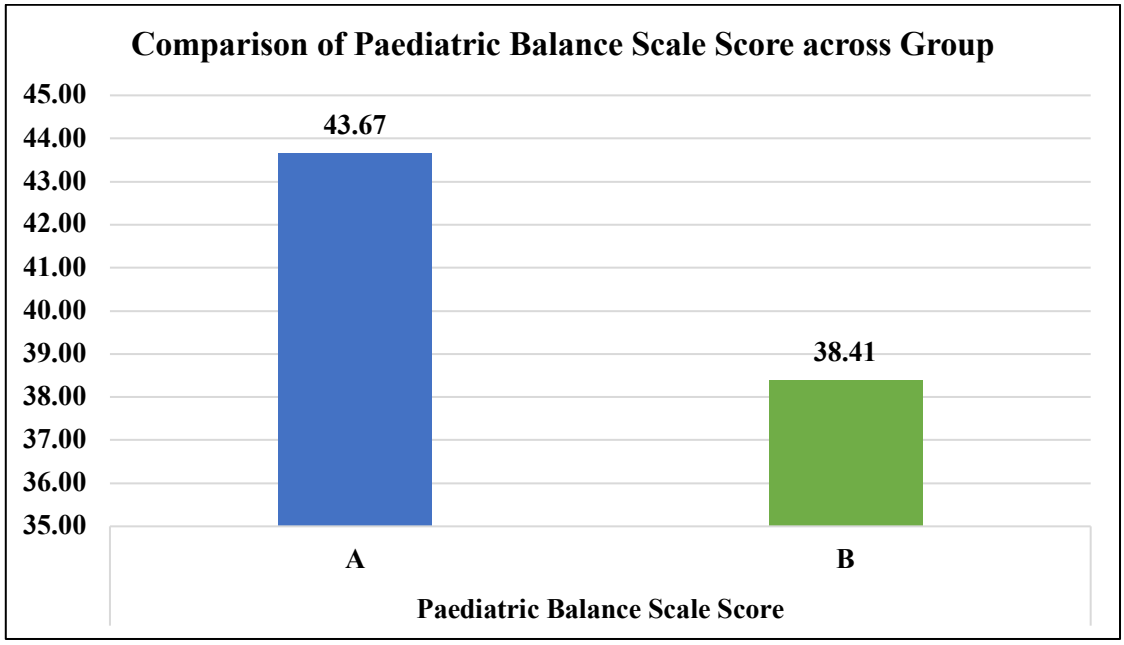

Table 5. Comparison between PBS scores in Group A and Group B

Result

It was proved that both exercises had beneficial effect on balance in specially abled athletes. Group A demonstrated better results after conventional training in balance.

Group B also showed good results after performing the Cawthorne-Cooksey exercise program.

Analysis of differences of outcome assessment after the intervention in the two research groups revealed statistically significant differences between these outcomes.

Group A had better final balance than Group B.

No statistically significant differences were found between IQ scores of the groups compared.

To conclude, conventional balance training appeared to be better in case of balance improvement in comparison with Cawthorne–Cooksey exercises.

DISCUSSION

The present study was conducted to compare the effectiveness of conventional balance training and Cawthorne–Cooksey exercises in improving functional balance among specially abled athletes aged 10–18 years. A total of 54 participants were included, with 27 participants in each group. Both interventions were administered for 30 minutes per session, three times weekly for four weeks. Balance was assessed before and after the intervention using the Paediatric Balance Scale (PBS). The findings demonstrated improvement in balance scores in both groups, with greater improvement observed in the conventional balance training group.

Effect of Conventional Balance Training on Balance

In the present study, Group A showed a significant improvement in PBS scores, from a mean baseline score of 36.70 to 43.67 after the intervention, with a mean improvement of 6.97 points ($p < 0.001$). This indicates that conventional balance training was effective in improving functional balance among specially abled athletes. The intervention included single-leg standing, tandem stance, balance-board exercises, tandem walking, and reaching activities, which challenge static and dynamic balance, postural stability, weight shifting, and coordination.

These findings are consistent with the systematic review and meta-analysis by Maïano et al., which reported positive effects of exercise interventions on static and dynamic balance among young individuals with intellectual disabilities.[14] Similarly, Jouira et al. reported differences in static postural balance between male athletes with intellectual disabilities and sedentary individuals, highlighting the importance of sports participation in balance performance.[12] The improvement observed in Group A may therefore be attributed to the task-specific nature of conventional balance exercises and repeated practice of functional movements.

Effect of Cawthorne–Cooksey Exercises on Balance

Group B also demonstrated a statistically significant improvement in PBS scores, from 36.78 before intervention to 38.41 after intervention, representing a mean increase of 1.63 points ($p < 0.001$). Cawthorne–Cooksey exercises incorporate eye, head, and body movements designed to improve coordination and facilitate vestibular rehabilitation. These activities challenge the integration of visual, vestibular, and somatosensory inputs required for maintaining postural stability.[22,23]

Han et al. described the role of vestibular rehabilitation exercises, including gaze-stability, habituation, and balance exercises, while Hall et al. supported vestibular rehabilitation for patients with peripheral vestibular hypofunction.[22,23] Furthermore, the systematic review by Alashram reported beneficial effects of Cawthorne–Cooksey exercises and other conventional interventions in individuals with vestibular symptoms, although evidence of superiority over other vestibular rehabilitation techniques was lacking.[25] The improvement in Group B supports the potential usefulness of these exercises; however, their effectiveness may depend on the nature of the balance impairment and the suitability of the intervention for the individual.

Comparison Between the Two Groups

The comparison of outcomes demonstrated that conventional balance training produced a greater improvement in functional balance than Cawthorne–Cooksey exercises. Group A showed a mean increase of 6.97 points, compared with 1.63 points in Group B. The baseline PBS scores were comparable between the groups (36.70 and 36.78, respectively), suggesting that the participants began the intervention with similar mean balance scores. The post-intervention score was also higher in Group A than in Group B.

The greater improvement in Group A may be related to the direct emphasis of conventional balance training on static and dynamic postural control, weight shifting, tandem walking, and balance-board activities. These exercises closely resemble the functional demands involved in maintaining stability during daily activities and sports participation. In contrast, Cawthorne–Cooksey exercises primarily emphasize eye, head, and trunk movements associated with vestibular rehabilitation.[22,25] Therefore, conventional balance training may have been more suitable for improving the functional balance measured by the PBS in the present study.

However, although the difference in improvement between the groups was numerically substantial, a direct statistical comparison of change scores was

not reported. Therefore, the findings support greater observed improvement with conventional balance training, but the statistical significance of the between-group difference in change should be interpreted cautiously.

Role of the Paediatric Balance Scale

The Paediatric Balance Scale was used to evaluate functional balance before and after the interventions. It consists of 14 functional balance tasks, each scored from 0 to 4, giving a maximum possible score of 56.[16] Higher scores indicate better balance performance. The improvement in PBS scores in both groups suggests that participants performed functional balance tasks more effectively after the training programmes.

Franjoine et al. reported high reliability of the PBS, while Chen et al. evaluated its validity and measurement properties in children with cerebral palsy. These findings support its clinical utility for assessing functional balance. Nevertheless, because the present study involved specially abled athletes with intellectual disabilities, the results should be interpreted in the context of this specific population. The PBS findings reflect changes in functional balance performance and do not independently establish improvements in every aspect of postural control.

Comparison of IQ Scores Between the Groups

The mean IQ score was 53.74 in Group A and 57.22 in Group B, with no statistically significant difference between the groups ($p = 0.188$). This indicates that the observed difference in baseline IQ scores was not statistically significant. Cognitive abilities may influence the understanding of instructions, learning of exercises, attention, and participation in structured training programmes. However, IQ was assessed as a participant characteristic, and the present study did not establish any relationship between IQ and balance improvement. Further research is required to examine whether cognitive and adaptive functioning, motor-learning ability, and the level of assistance required influence the effectiveness of balance interventions.

Distribution by Sex and General Participant Characteristics

The study included 36 male participants (66.7%) and 18 female participants (33.3%). Although males constituted the majority of the study population, the available results do not establish whether sex influenced the response to either intervention. Similarly, differences in age, physical capabilities, previous sports experience, sensory perception, and individual support requirements may influence balance performance among specially abled athletes.[8] Since balance outcomes were not reported separately according to these characteristics, their contribution to the observed improvements could not be determined.

Clinical Implications

The findings suggest that structured balance training may be beneficial for improving functional balance among specially abled athletes aged 10–18 years. Conventional balance training demonstrated a greater observed improvement in PBS scores and may be considered when the primary rehabilitation goal is to enhance static and dynamic balance, postural stability, and functional mobility.

Exercises such as tandem walking, single-leg standing, reaching activities, and balance-board training can be modified according to individual abilities and tolerance, with appropriate supervision to maintain safety. Cawthorne–Cooksey exercises may also be useful when vestibular rehabilitation is indicated.[22,23,25] The selection of an intervention should therefore be guided by an individual assessment of balance deficits, functional requirements, and rehabilitation goals rather than assuming that one programme is universally superior.

Overall, the present study demonstrated improvement in functional balance following both interventions, with a greater numerical improvement following conventional balance training. These findings highlight the potential value of structured, task-specific balance exercises in rehabilitation programmes for specially abled athletes. Further studies with larger samples, longer follow-up periods, and direct statistical comparisons of between-group changes are needed to establish the comparative effectiveness and long-term benefits of these interventions.

CONCLUSION

Thus, in the given study there were compared efficiency of conventional balance training and Cawthorne-Cooksey exercises for improving the balance of special abled athletes. The results show the improvement of balance among the patients following both interventions. However, the Group A which received conventional balance training had better changes of Paediatric Balance Scale score than the Group B which performed Cawthorne-Cooksey exercises. Similarly, the final score of balance was higher in the Group A than in the Group B; the changes were statistically significant. So, conventional balance training may be more efficient intervention for improving functional balance among the patients who suffer from vestibular disorders. Nevertheless, the effectiveness of Cawthorne-Cooksey exercises was shown as well and it can be used for appropriate rehabilitation purposes. There were no significant differences in terms of IQ scores between the groups. Therefore, the given interventions are appropriate interventions

for improving the balance among the patients who are affected by vestibular disorders and for rehabilitation.

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