"Effects of Manual Ankle Rocking Training on Postural Control and Foot Function in children with Down Syndrome"

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ABSTRACT

Background: Down syndrome occurs due to abnormal cell division of extra chromosome 21. Strengthening exercise of lowerlimb and core strengthening of trunk muscle provide postural stability and lower limb strengthening. Aim of this research was to determine the effects of manual Ankle rocking training on postural control and foot function in children with Down syndrome.

Objective: To determine the effects of manual ankle rocking training on postural control and foot function in children with Down syndrome.

Method: This was a Randomized controlled trial and a non-probability convenient sampling technique was used. In this study, 30 children with Down syndrome were selected, 15 in the experimental group and 15 in the control group. Both groups received balance and core stability training, but only the experimental group received the manual ankle rocking training to assess the effects on postural control and foot function.

Result: Each group showed significant improvement in postural control and foot function ($p<0.05$) but the manual ankle rocking training combination showed better results in improvement.

Conclusion: This study concluded that performing balance exercises along with manual ankle rocking training had better results than doing balance and core stability exercises alone. Down syndrome children's postural control and foot function benefited from combo therapy.

Key Words: Balance, Down syndrome, Postural control, Posture stability.

INTRODUCTION:

Trisomy 21, the presence of a supernumerary chromosome 21, results in a collection of clinical features commonly known as Down syndrome (DS). DS is among the most genetically complex of the conditions that are compatible with human survival post-term, and the most frequent

survivable autosomal aneuploidy. (1) Children with Down syndrome tend to exhibit a reduced postural tone (hypotonia) that negatively affects muscular co-activation and balance reactions, and relates to deficits in proprioceptive feedback and hypermobility or joint laxity. (2, 3) Balance/postural control is fundamental to the ability to safely accomplish movements or motor tasks characterizing daily life. (4) As such, these postural and balance deficits represent a serious functional limitation for this population. Among youths with Down syndrome, these balance/postural deficits may even heighten motor delays or impairments, (5, 6) increase risks of body instability, falls and fall-related injuries, and lead to activity limitations or participation restriction. Therefore, the improvement of balance and postural control among youths with Down syndrome represents a key issue.

The postural control in Down syndrome also occurs due to contraction of muscles, stable back and tone of muscles. Regular exercises can build muscle tone and posture and can prevent them from falling (7). Postural control is the capability to uphold, accomplish, and reinstate equilibrium in any approvedposition. It is not only required for maintaining posture, but also for flexibility, stability and mobility presentation of regular accomplishments in a harmless method and in response to exteriortrouble (8). Static postural control refers to the ability to control one's body position in space for the dual purposes of stability and orientation. It is a complex process that requires the coordination of several sensory, motor, and biomechanical inputs. It is generally accepted that the mean velocity of the center of pressure displacements is an indicator of postural stability with a greater velocity indicating a decrease in postural stability (9). Basic pattern of coordination requires three steps ankle approach, hip approach, and stepping approach is available for both children and teenagers. Walking requires three rockers the heel rocker, the ankle rocker, and the forefoot rocker. Though foot situation at early interaction in consecutively has been lengthily calculated, slight investigation has enclosed foot and ankle motion in running in setting of the foot rockers even though at sluggish running hurries (10).

The sensorial integration disorders present in children with Down syndrome lead to a late development of postural control that can last until adulthood (11). Postural uncertainty in people having Down syndrome is documented to be significance of their characteristic of musculoskeletal of slack ligament and summarized submissive toughness around motion junctions. To prepare such joint leniency,investigators have inspected the consequence of foot orthoses on motor services expansion in children and kids having DS (12).

Individuals which are undergoing Down syndrome can have diverse effects in cardiovascular and respiratory structure in answer to bodily movement related by TD objects, furthermore, these entities show unstable muscle stimulation outlines, deprived postural control, not coordinating with motor activities, sluggish adaptation to environmental modifications, synchronized contraction of agonist and antagonist muscle with dystonia (13). The radiographic studies of foot erection in Down syndrome kids by pes planus presented massive talo first-metatarsal approach, low navicular elevation and calcaneal inclination angle are showing irregular orientation of foot joint (talonavicular and calcaneocuboid joint). Approximately trainings pointed that the ligament tolerance and decrease muscle tone triggered by genetic problem and these are foremost explanations for Down syndrome teens' pes planus that also persuade irregular arrangement of foot (14).

DS is the predominant chromosomal syndrome in anthropoid existences, actuality categorized through an extra chromosome 21 to the pair. This organizational mistake can lead to consequences of damages in Frame Assembly and Purpose that comprise in decrease muscle tone, joint laxity, postural control damages, and cognitive issues (10).

Posture might be distinct as ones capability to retain themselves straight and constant at the same time as struggling with gravity equally static and dynamic situations. Upright postural steadiness is attained through upholding the midpoint compression inside the base of sustenance like any part of foot. The anthropoid physique is in continuous overturned bob-like influential wave once you standup in erect position after putting together feet on floor in answer of in height amount of exterior, interior evidence and variables attained in body (i.e. hearing, graphic, proprioceptive, physical and mental stress, exhaustion, etc.) (15). Hypotonia leads to diminished muscular strength, restrict activities of daily life and joints are hypermobile, which affects their function and take more time to develop gross motor skills, poor stability, and coordination (16). Postural control is described as in what way the central nervous system controls sensory evidence as of further structures to make suitable motor production to sustain a skillful erect posture. It's a difficult process which associates mutually postural alignment and postural steadiness (17).

Reduced fronto-parietal gray matter and front striatal white matter areas are the key reasons of gait and balance damages in elderly adults Children which are suffering from down syndrome they have to memorize how to walk and obtain several other essential skills far along than child's with an ordinary growth (18). Atypical gait outline is the motor impairments in individuals with Down syndrome. It effects the growth of cognitive, social, and additional multifaceted motor skills like running and hopping. Overall interruptions in beginning of independent walking, premature deterioration of the walk patterns, and spatiotemporal differences in gait patterns in lifetime causes an exclusive gait pattern in Down syndrome (19). Children with Down syndrome do not entirely accomplish the motor skills restrained by the GMFM by stage of development of 6 years. Motor tasks are particularly significant like they subsidize to subordinate stages of bodily movement on children having Down syndrome that reduces more with increasing stage (20).

Stability and intellectual difficulties cause decrease flexibility in patients suffering from Down syndrome (21). Both intellectual and attentional tasks, i.e., moving from one surface to another while speaking on the handset and walking while holding something in hands while maintaining balance is difficult for down syndrome (22).

The part of physical therapist in Down syndrome for kids is to accomplish an initial interference programed to progress main motor abilities, like moving from one place to another, stability and hopping to avoid upcoming difficulties. Physical therapist improve the volume of the cardiopulmonary, muscle potency and weight influence (23). Down syndrome leads to a different gait phenotype distinguished through low walking speed, reduced footstep measurement, bigger footstep width, stability deficits, joints unsteadiness and kinematic adjustments such as extreme pelvic tilt and knee flexion, restricted hip and knee ROM (24).

Individuals with Down syndrome, who are susceptible to become bulky or overweight with medical situations like hypothyroidism that influence on their bodily mechanisms, indicated to be double as expected to have unnatural mass increase as children with typical development (25). The sensorial incorporation syndromes, existing in kids with Down syndrome, can lately cause late progress of postural control that can last till the child is all grown up (7).

In Down syndrome children, mean rapidity of the midpoint compression translations indicates reduction in postural balance (26). Together stability damages and physical laziness can cause a great reduction in quality of life and essential movement skills (27). Entities with characteristic growth, it remained recognized that children produce, postural controller progressively increases then spreads the situation furthermost progressive growth opinion on initial steps of grownup lifespan (28). Intellectual and perceptual harms can lead to stability shortages in Down syndrome

children. Since nearly all motor project need postural control, stability skills which is important for events of everyday and also for self-governing motions (29).

Chief objective is to assess the efficiency of physical therapy on the bodily conclusions like vestibular, cardiovascular and respiratory, weight preservation and program linked purposes, motor aids, resounding obtainable responsibilities in DS children (23). Postural constancy and stability are used to be chief subject that disturbs individuality services of child with Down syndrome. Walk is a chief point of motor growth in individuals. It can disturb perception, sociality, and complex motor skills like running and hopping (30). Child having down syndrome appear to display a late motor development that may occur because of low muscle tone, ligamentous leniency, poor stability, and absence of postural control that lead to complications in adjusting to surrounding atmosphere (31).

Down syndrome take more time than individual with normal growth in the achievement of few motor skills like crawling and moving from one place to another autonomously, and later have difficulties with stability, walking problems, coordination and physical organization (32).

Foot difficulties can cause limitation to people involve in physical movement for kids and grown-ups with DS. Footwear fitting is an significant issue to reflect because their foot are typically extensive for measurement in children with DS (33). Balance assessments must justify the difficulty and multidimensional type of stability that is regulated by different mechanisms. The medical stability measures which is informal to practice and assesses dissimilar balance mechanisms is the stationary and dynamic scheduled upright stability examination (34). Kids with Down syndrome had decrease muscle power of hip abductors and the knee extensors, correspondingly have decrease quadriceps power. There is a straight relation between keeping steadiness and sensory data, range of motion, coordination (35). Postural variations in Down syndrome might arise due to the trouble of awareness of postural reactions, which damages the sensation of the motion properly (36).

Stability is investigated on a stage and by a transformation in sensory circumstances, a judgment of open eyes with closed eyes discloses some changes between children with and without Down syndrome. For example, larger variations were detected in typical development applicants than those diagnosed with Down syndrome probable cause the concluding had trouble mixing sensory evidence (37).

Investigation of task-oriented postural stability in Down syndrome will support to recognize that how these individual performance and interrelate with their atmosphere, and the approaches they utilize for sustaining postural control (38, 39). Down syndrome having flat foot disorder is usually due to decrease muscle tone and ligamentous tolerance, which are common structures of this condition (40). Stability control is the main reason that encourages the capability to accomplish upright standing. Steadiness control is one of the greatest problematic motor function for Down syndrome to obtain (41).

Limited researches examined the effects of flat foot in Down syndrome children (42). Treadmill exercise is used for DS children that benefits for progressing stability and make power of both legs as to move from one place to another former and extra proficiently than kids whom did not attain somewhat treadmill plans (43). Down syndrome children have greater prevalence of obesity (35). Children with Down syndrome demonstrate decrease stages of cardiovascular capability than rest of public. This can be improved by aerobic workout physical activity database. Concentrated muscle power and ligament slackness are communal musculoskeletal damages along with decrease tone, which has a bad result on proprioceptive response from muscle and joint units (44). The increase in mobility in children with Down syndrome disturbs steadiness and the capability to

successfully control position, particularly in activities such as upright standing, moving from one place to another and voluntary actions of the limbs, trunk, and head (45).
Down syndrome children have lesser scores on steadiness and dexterity responsibilities along with on moving speed, power, and visual-motor regulator than individual with other mental damages (46). Postural steadiness is an amount restricting issue and a requirement for a prodigious amount of motor skills (walking, sitting, and standing). Bad steadiness give rises to chances of dropping and limiting the physical movement (47).
Ankle rocking training is basically a foot rocker movement in dorsiflexion and plantar flexion and it will develop good strengthening not only on foot but also on the whole body. Postural control and foot functions both are important in Down syndrome because they maintain child stability, mobility and some control in the trunk. Due to delayed gross motor function, not only the balance is interrupted but also the whole alignment of spine is disturbed. Most of the Down syndrome are flat feet so by focusing on foot, the child can be provided help to maintain the whole-body posture by strengthening the muscles. The aim of the study was to determine the importance of manual Ankle rocking training on postural control and foot function in children with Down syndrome.

MATERIALS AND METHODS:

It was a Randomized controlled Trial and Convenient Sampling Technique was used. Data was collected from Rising Sun Institute for special children Lahore within 6 months after the approval of synopsis. This sample size was calculated from epitool from the article Postural control during standing reach in individuals with DS.
Inputs were Mean 1=1.043 with variance 1=0.484, Mean 2=0.281 with variance 2=0.098 , Confidence level was 0.99 with power = 0.9, Ratio of sample sizes (n2/n1) was 1 and tails were 2. Results of Sample sizes were: Sample size 1 (n1) = 15 and Sample size 2 (n2) = 15 and total sample size (both groups) = 30. So, final sample size was 30.
Participant was assigned in two groups randomly through lottery method. Experimental group A included 15 children and they were given baseline treatment exercise (Core stability exercises) to control the posture and strengthen the abdominal muscle with Manual ankle rocking training to maintain balance. Control group B included 15 children and they were given baseline treatment (core stability exercises) to control the posture and balance.
This study included diagnosed children with Down syndrome between the ages of 8 and 15 years, both genders (male and female) with Down syndrome with pes planus, who can independently perform movement and have the intellectual and physical ability. The study excluded children with Down syndrome who also had musculoskeletal contractures, visual or other sensory input impairment, any surgical procedure, a history of congenital heart disease, orthopedic surgery within the preceding year, and attentional and hyperactivity impairments.
Foot function index was used to check the pain, disability and activity limitation of foot changes that were not helping in achieving the activities of daily life. Static standing balance test was used to check the postural stability in which it was divided into 10 items sitting with eyes open and close, stride standing with eyes open and close, close standing with open and close, One-foot standing on the unanalyzed leg with eyes open, one foot standing on the unanalyzed leg with eyes close, One-foot standing on the paralyzed leg with eyes open, one foot standing on the paralyzed with eyes close.
In this study experimental group performed core stability exercises, balance training exercises and manual ankle rocking training 4 times per week for an 8-week period and each session of 40 to 60 minutes, the core stability exercises will work on abdominals and trunk muscles with challenges.

Readings were taken before and after the sessions from tools (foot function index to check the foot posture that can it maintain the balance of body and static standing balance test to check the stability).

Treatment protocol for Experimental Group A:

Treatment protocols for first and second weeks involved contracting abdominal muscles though lying in a supine position (3 sets and 20 reps in each set), contracting abdominal muscles while lying in a prone position (3 sets and 20 reps in each set) , strengthening of abdominal and para spinal muscle, flexibility trainings for calf muscles can increase (ROM) in patients with restricted range of flexibility (ROM) and poor equilibrium, strengthen the muscle to build power in antigravity muscle, gait training in a method of closed atmosphere, walking in all commands; frontward, backward, and sideways, and hindrances will be cast-off on the pathway inside and outside, Sit to stand (20rep), standing with one leg with eyes open and close , manual ankle rocking training with wedges (20 rep), balance training program by kneeling on the balance board, stand-up on the balance board, one leg stance on the balance board , gait training on balance board, gait training on balance beam and gait training on balance board with hindrances on it.

In third week treatment protocol was contracting abdominal muscles while lying in a supine position (3 sets and 20 reps in each set), contracting abdominal muscles while lying in a prone position (3 sets and 20 reps in each set), sit to stand (20 rep), sitting on Swiss ball and pelvic rotation, supine line on Swiss ball and abdominal crunches, manual ankle rocking training with wedges. (30 rep), strengthening of abdominal and para spinal muscle, flexibility trainings for calf muscles can increase (ROM) in patients with restricted range of flexibility (ROM) and poor equilibrium, strengthen the muscle to build power in antigravity muscle, gait training in a method of closed atmosphere, walking in all commands; frontward, backward, and sideways, and hindrances will be cast-off on the pathway inside and outside, sit to stand (20rep), standing with one leg with eyes open and close, balance training program by kneeling on the balance board, stand-up on the balance board, one leg stance on the balance board , gait training on balance board, gait training on balance beam and gait training on balance board with hindrances on it.

While in forth week treatment plan was contracting abdominal muscles while lying in a supine position and pulling the limbs ascendant with arms and legs kept close together (3 sets and 20 reps in each set), squats, sit to stand (20 rep), strengthening of hip flexors and extensors, manual ankle rocking training with wedges. (30 rep), strengthening of abdominal and para spinal muscle, flexibility trainings for calf muscles can increase (ROM) in patients with restricted range of flexibility (ROM) and poor equilibrium, strengthen the muscle to build power in antigravity muscle, gait training in a method of closed atmosphere, walking in all commands; frontward, backward, and sideways, and hindrances will be cast-off on the pathway inside and outside, standing with one leg with eyes open and close, balance training program by kneeling on the balance board, stand-up on the balance board, one leg stance on the balance board, gait training on balance board, gait training on balance beam and gait training on balance board with hindrances on it.

In 5^{th} week, treatment was sitting on a Swiss ball and holding the abdomen in (3 sets ,10 seconds), strengthening of flexors and extensors, sit to stand (25), manual ankle rocking training with wedges (35 rep), strengthening of abdominal and para spinal muscle, flexibility trainings for calf muscles can increase (ROM) in patients with restricted range of flexibility (ROM) and poor equilibrium, strengthen the muscle to build power in antigravity muscle, gait training in a method of closed atmosphere, walking in all commands; frontward, backward, and sideways, and hindrances will be cast-off on the pathway inside and outside, standing with one leg with eyes open and close,

balance training program by kneeling on the balance board, stand-up on the balance board, one leg stance on the balance board, gait training on balance board, gait training on balance beam and gait training on balance board with hindrances on it.

In 6th week, treatment was contracting abdominal muscles while lying in a supine position on the Swiss ball (3 sets and 20 reps for each set), strengthening hip flexors and extensors, squats, manual ankle rocking training with wedges. 35(rep), strengthening of abdominal and para spinal muscle, flexibility trainings for calf muscles can increase (ROM) in patients with restricted range of flexibility (ROM) and poor equilibrium, strengthen the muscle to build power in antigravity muscle, gait training in a method of closed atmosphere, walking in all commands; frontward, backward, and sideways, and hindrances will be cast-off on the pathway inside and outside, standing with one leg with eyes open and close, balance training program by kneeling on the balance board, stand-up on the balance board, one leg stance on the balance board, gait training on balance board, gait training on balance beam and gait training on balance board with hindrances on it.

In 7th week, treatment was lying supine on the Swiss ball and rotating the trunk to the sides (3 sets and 15 reps for each set), doing the above exercise with holding weights in the hands (3 sets and 15 reps for each set), sit to stand (20 rep), manual ankle rocking training with wedges. 35 (rep), strengthening of abdominal and para spinal muscle, flexibility trainings for calf muscles can increase (ROM) in patients with restricted range of flexibility (ROM) and poor equilibrium, strengthen the muscle to build power in antigravity muscle, gait training in a method of closed atmosphere, walking in all commands; frontward, backward, and sideways, and hindrances will be cast-off on the pathway inside and outside, standing with one leg with eyes open and close, balance training program by kneeling on the balance board, stand-up on the balance board, one leg stance on the balance board, gait training on balance board, gait training on balance beam and gait training on balance board with hindrances on it.

In 8th week, treatment was lying supine on the Swiss ball and holding the abdomen in and bringing one leg up (3 sets and 20 reps for each set), bridging, squats, and manual ankle rocking training with wedges. (40 rep), strengthening of abdominal and para spinal muscle, flexibility trainings for calf muscles can increase (ROM) in patients with restricted range of flexibility (ROM) and poor equilibrium, strengthen the muscle to build power in antigravity muscle, gait training in a method of closed atmosphere, walking in all commands; frontward, backward, and sideways, and hindrances will be cast-off on the pathway inside and outside, standing with one leg with eyes open and close, balance training program by kneeling on the balance board, stand-up on the balance board, one leg stance on the balance board, gait training on balance board, gait training on balance beam and gait training on balance board with hindrances on it.

Treatment protocol for controlled group B:

Control group received conventional therapy for strength balance and postural control including two to three times per day, each contraction will maintain for five counts, then relaxation for another five counts, high step standing and try to keep balanced and all the other therapies that are given to experimental group will be performed but manual ankle rocking training was not performed in control group and after these sessions again the readings were taken to check the difference between both groups, strengthening of abdominal and para spinal muscle, flexibility trainings for calf muscles can increase (ROM) in patients with restricted range of flexibility (ROM) and poor equilibrium, strengthen the muscle to build power in antigravity muscle, gait training in a method of closed atmosphere, walking in all commands; frontward, backward, and sideways, and hindrances will be cast-off on the pathway inside and outside, sit to stand (20rep), standing

with one leg with eyes open and close, balance training program by kneeling on the balance board, stand-up on the balance board, one leg stance on the balance board, gait training on balance board, gait training on balance beam and gait training on balance board with hindrances on it.
Data was analyzed using SPSS version 29. First the normality of the data was checked by Shapiro-wilk test. The data was normally distributed and parametric tests were applied because significance value was greater than 0.05. So, independent sample t test was applied to check differences between the group and paired sample t test was applied to check with-in group differences.

RESULTS:

This study included 30 children of Down syndrome, who were taken 15 in experimental group and 15 in control group. Balance exercises and core stability exercises were given to both groups but the intervention manual ankle rocking training was only given to experimental group to check the effect on postural control and foot function. After putting data in SPSS, the normality of data was checked by Shapiro wilk test and the significance value was greater than 0.05, so parametric tests were applied.
The histogram of age showed 10.73 mean and 1.639 standard deviation. The independent sample t test showed 0.24 in pre standing balance test significance and post 0.21 and pre and post of pain scale was 0.38 and 0.27 and pre and post disability scale showed significance 0.23 and 0.20 and activity limitation showed 0.25 and 0.21 respectively.
The paired sample t test showed 0.042 significance in pre and post standing balance test and pain scale showed pre and pro significance is 0.000 and disability scale 0.000 activity limitation showed 0.000 pre and post respectively.

Table 1: Ages of Participants

Age (in Years)	Frequency (n)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
5	1	3.3	3.3	3.3
8	1	3.3	3.3	6.7
9	1	3.3	3.3	10.0
10	11	36.7	36.7	46.7
11	5	16.7	16.7	63.3
12	8	26.7	26.7	90.0
13	3	10.0	10.0	100.0
Total	30	100.0	100.0	

Table 1 showed the values of ages and 10.73 was mean and 1.639 was standard deviation of ages.

Table 2 A: Pre Values

Variables	N	Mean	Std. Deviation
Sitting with open eyes (pre)	30	1.5000	.57235
Sitting with eyes close (pre)	30	2.1667	.53067
Stride standing with close eyes (pre)	30	2.0000	.69481
Group	30	1.5000	.50855
Stride standing with eyes eyes open (pre)	30	1.9333	.63968

Close standing with eyes open (pre)	30	2.1333	.34575
Close standing with eyes close (pre)	30	1.8333	.59209
One foot standing on unparalyzed leg with open eyes (pre)	30	1.6667	.60648
One foot standing on unparalyzed leg with close eyes(pre)	30	1.9000	.60743
One foot standing on paralyzed leg with eyes open(pre)	30	1.7333	.63968
One foot standing on paralyzed leg with eyes close(pre)	30	1.8667	.62881
Pain in the morning upon taking your first step (pre pain scale)	30	1.6000	.67466
Pain standing barefoot(pre pain scale)	30	1.2667	.44978
Pain walking barefoot(pre pain scale)	30	1.5000	.50855
Pain standing with shoes(pre pain scale)	30	1.5667	.50401
Pain walking with shoes (pre pain scale)	30	1.7333	.44978
Pain standing with orthotics (pre pain scale)	30	1.5000	.50855
Pain walking with orthotics (pre pain scale)	30	1.5667	.50401
How was pain at the end of the day(pre pain scale)	30	1.4333	.50401
How severe is pain at its worst(pre pain scale)	30	1.3333	.47946
Total score of pain scale	30	47.90	7.595
Difficulty when walking in a house (pre disability scale)	30	1.5000	.50855
Difficulty when walking outside(pre disability scale)	30	1.5667	.50401
Difficulty when walking four blocks (pre disability scale)	30	1.5333	.50742
Difficulty when climbing stairs (pre disability scale)	30	1.5000	.50855
Difficulty when descending stairs (pre Disability scale)	30	1.5333	.50742
Difficulty when getting out of chair (pre disability scale)	30	1.5333	.50742
Difficulty when climbing curbs (pre disability scale)	30	1.6667	.47946
Difficulty when standing tip toe (pre disability scale)	30	1.5333	.50742
Difficulty when running or fast walking (pre disability scale)	30	1.5667	.50401
Total disability score	30	50.47	8.776
Stay indoor all day due to feet (pre activity limitation)	30	1.3667	.49013
Stay in bed all day due to feet (pre activity limitation)	30	1.0000	.00000
Use an assistive device (stick, walker, crutches, frames) indoors (pre activity limitaion)	30	1.0000	.00000
Use an assistive device outdoor(pre activity limitation)	30	1.0333	.18257
Limit physical activity (pre activity limitation)	30	1.4667	.50742
Activity limitation total score	30	22.67	2.324

Table 2A showed pre values of mean and standard deviation of static standing balance test and foot function index.

Table 2B: Post Values

Variables	N	Mean	Std. Deviation
Sitting with eyes open (post)	30	1.4000	.49827
Sitting with eyes close (post)	30	1.6667	.47946
Stride standing with eyes close (post)	30	1.5000	.50855
Stride standing with eyes open (post)	30	1.5333	.50742
Close standing with eyes open (post)	30	1.7333	.63968
Close standing with eyes close (post)	30	1.7000	.59596
One foot standing on the unparalyzed leg with eyes open (post)	30	1.8333	.69893
One foot standing on the unparalyzed leg with eyes close(post)	30	1.8667	.62881
One foot standing on the paralyzed leg with eyes open (post)	30	1.8667	.62881
One foot standing on the paralyzed leg with eyes close (post)	30	2.0000	.64327
Pain in the morning upon taking first step (postpainscale)	30	1.1000	.30513
Pain standing barefoot (post pain scale)	30	1.1667	.37905
Pain walking barefoot (post pain scale)	30	1.4333	.50401
Pain standing with shoes (post pain scale)	30	1.5000	.50855
Pain walking with shoes (post pain scale)	30	1.5000	.50855
Pain standing with orthotics (post pain scale)	30	1.4333	.50401
Pain walking with orthotics (post pain scale)	30	1.3000	.46609
How is pain at the end of the day (post pain scale)	30	1.4000	.49827
How severe is pain at its worst (post pain scale)	30	1.1667	.37905
Post pain scale total score	30	39.70	7.415
Difficulty while walking in the house (post disability scale)	30	1.0000	.00000
Difficulty while walking outside (post disability scale)	30	1.3667	.49013

Table 2B showed post values of mean and standard deviation of static standing balance test and foot function index.

Table 3: Test of Normality:

Shapiro wilk test	Statistic	Df	Sig.
Total pre static standing balance test	.597	30	.055
Total score of pain scale	.878	30	.057
Total disability score	.960	30	.310
Activity limitation total score	.834	30	.072

The significance value was greater than 0.05 indicating that data was normally distributed, so parametric tests were used.

Table 4: Independent sample t test

Levine's Test for Equality of Variances						
		F	Sig.	t	Df	Sig. (2-tailed)
Total pre static standing balance test	Equal variances assumed	2.120	.157	-.756	28	.024
	Equal variances not assumed			-.756	27.711	.035
Total score of pain scale	Equal variances assumed	.526	.474	-.498	28	.038
	Equal variances not assumed			-.498	22.682	.044
Total disability score	Equal variances assumed	.001	.972	.743	28	.023
	Equal variances not assumed			.743	27.996	.038
Activity limitation total score	Equal variances assumed	.005	.945	1.104	28	.021
	Equal variances not assumed			1.104	27.225	.035
Total post static standing balance test	Equal variances assumed	2.635	.116	.807	28	.020
	Equal variances not assumed			.807	27.277	.028
Post pain scale total score	Equal variances assumed	.642	.430	-3.351	28	.030
	Equal variances not assumed			-3.351	25.671	.032
Post total disability score	Equal variances assumed	.063	.804	.941	28	.019
	Equal variances not assumed			.941	27.975	.030

Post total activity limitation score	Equal variances assumed	.138	.713	-1.614	28	.020
	Equal variances not assumed			-1.614	27.749	.025

This table showed that p value was less than 0.05, so the values were significant.

Table 5: Paired Samples Test

		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		T	Df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Total pre static standing balance test - total post static standing balance test	.06667	.44978	.08212	.10128	.23462	.812	29	.042
Pair 2	Total score of pain scale - post pain scale total score	8.200	5.684	1.038	6.078	10.322	7.902	29	.000
Pair 3	Total disability score - post total disability score	7.067	2.318	.423	6.201	7.932	16.695	29	.000
Pair 4	Activity limitation total score - post total activity limitation score	4.533	2.529	.462	3.589	5.478	9.818	29	.000

The significance value showed less than 0.5 so there was significant improvement in Down syndrome with manual ankle rocking training.

DISCUSSION:

This study was done to see the effect of manual ankle rocking training on postural control in down syndrome children in which this study did show some effects on down syndrome but they were not much different from the study that was conducted in 2016 (Balan V) in which the postural control was maintained by keeping the body in steady position and gave effect while doing static and dynamic balance and this helped the down syndrome children to maintain the balance. Simple exercises of balance were also done like single leg standing and all these balance exercises gave good effect (48).

In this present study balance exercises were given with manual ankle rocking training to experimental group and control group only had balance exercises in which the both groups showed almost same effect but ankle rocking training did give some better results than of control group the effects of balance are not much different from the research that was conducted in 2018 (Capio CM) in which they showed balance maintenance is important for down syndrome children how it helped children's with certain movements like balance is not important for walking but also for running, jumping, and doing further activities . Balance training can affect in different ways not only static but also for dynamic movements and this 2018 research also showed that memory is not important to maintain balance (25).

This study showed improvement in sitting and standing and walking because all balance exercises developed a good stability in body to hold position for longer time those who were showing chronic illness didn't give much good response but overall, it showed better effects and similar study was done in 2021 (adeeb n) in which this also showed effects of balance exercises in static and dynamic movements but no exercise has superior effect all gives the same effect to maintain balance in down syndrome children. It also depends on children as well that how much they cooperate and perform balance exercises (16).

In this present study foot function was also showing better effects and there was lesser pain than before and it also helped to maintain balance and postural control as the body can move more comfortably manual ankle rocking training gave good effect in foot. Postural regulator may be qualified to management of hip protraction/retraction, ankle control, and foot intrinsic muscle movement these are the effects that develop postural regulator and stability in down syndrome individual as it is showing similar results as in study conducted in 2021(Eltohamy AM) if there is pain that could be due to abnormal foot postures occur due to muscle stiffness and disproportion, soft-tissue contractures, bony torsion and joint uncertainty. This present study also showed effects with ankle rocking training (9).

This present study gave good effect of balance than the study conducted in 2017 (Guzmán-Muñoz E) they didn't get any good effect in balance in children with down syndrome as they should give more balance training and more time should be given to this study as balance has an significant part in the progress of down syndrome so this study that was conducted in 2017 should focus on balance training and this present study is showing better effects and children of down syndrome were having lesser pain and moving better than before a compared to the other study (28).

Study conducted in 2020 (palomba A) shows that simple balance training has no better effects and we should combine some exercise with balance exercises to see more better results as this present study is combined balance exercises with manual ankle rocking training and it gave good effects on balance as the movement in heel helped the whole body to restore balance. Bodily movement is mostly advised to patients with Down syndrome to progress their stability and avoid dropping hazard. So more studies can give good effect on balance and can also help improve the foot

function however balance training can also help to strengthen muscle up and it also develop coordination for muscles to move easily and maintain stability (27).
In the past study 2016 (Jung H-K) it gave the concept of balance and gait ability that improves during growth, however children with Down syndrome remain low contempt in maintaining their gait independently. That's why continuous therapeutic intervention is important for balance and gait function after the down syndrome children develop independent gait is developed so balance in this present study shows that it can provide stability and it is important from the initial stage to develop balance in down syndrome children (30).

CONCLUSION:

This study concluded that manual ankle rocking training gave better effects with balance exercise than only doing balance exercises. This research shows that combination was benefit for providing postural control and foot function in children with Down syndrome. Intervention was effective for Down syndrome it didn't show much difference from other studies but pre and post conditions showed good effects for maintaining balance and the patient was having less pain than before. Pre and post study effects on experimental group showed good effects but control group showed more better effects as ankle rocking training helped more to maintain the stability it could help the down syndrome children to hold the postures better.

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