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Review Article

Clinical Review Effect of Exercise to Improve Balance Among Stroke Survivor

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HIGHLIGHTS

1. Clinical review: Impact of exercise on stroke survivors.
2. Exercise's role in enhancing balance post-stroke.
3. Improving balance in stroke survivors through exercise.
4. The clinical perspective: Exercise for stroke survivors.
5. Enhancing post-stroke balance with targeted exercise.

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ABSTRACT

Background and purpose: Balance impairment is commonly seen in post-stroke patients. Post-stroke balance impairment is an important barrier in the activity of daily living, social interaction, and participation, and is more difficult to return pre-injury level lifestyle. Rehabilitation is used to bring back post-stroke patients to their pre-injury level lifestyle and improve their ability to return his work. This study aims to review the effect of exercise on improving balance and coordination among stroke patients. **Methodology:** The literature searches for electronic databases involve CINHAL, MEDLINE, PubMed, and other databases. In this article, 7 randomized control trials, 1 experimental study, 1 clinical control trial, and 1cross sectional study were reviewed. **Conclusion:** Balance training in visually restricted conditions, task-specific balance training, Swiss ball exercise, sling exercise therapy, bad ragas ring method, balance and postural exercise with a balance trainer are more effective compared to other conventional physiotherapy to improve balance. The background of this study revolves around the common occurrence of balance impairment in individuals who have experienced a stroke. This impairment presents a significant barrier to their daily activities, social interactions, and overall participation in life.

INTRODUCTION

Stroke is a condition in which the blood supply of the brain is obstructed or sudden rupture of an artery that leads to bleeding in the brain called stroke[1]. A study says that in the United States prevalence of stroke is 800,000 cases per annum and stroke incidence is 160 per 100000 which doubles every decade. stroke is the most common cause of death and acquired disability in the world and its prevalence rate 5 and a half million people die by stroke annually, over 116 million years of health are lost each year due to stroke. Every year approx. 610000 are first attacks and 18500 are recurrent stroke[2].

stroke has 2 types – ischaemic stroke and haemorrhagic stroke, The brain receives continued oxygen and nutrients in the form of a rich blood supply. When this supply is stopped suddenly, brain cells start to die and get infarct resulting ischaemic stroke. Increase pressure in an artery can result in rupture of artery which leads to bleeding in the brain. Haemorrhagic symptoms are severe headache with vomiting, loss of consciousness, confusion, slurry speech, sudden numbness, weakness, paralysis of half of the body means one side face, arm, leg and one side mouth drooping when smile, blurry vision[3]. After the occurrence of a stroke patient may develop impairments such as motor deficits, sensory deficits, speech and language disorders, perceptual problems, and abnormal reflexes[4]. Post stroke patient are not able to stand and walk so they are not able to perform ADLS and they get functional dependence and they are depressed. It more need to improve their balance and coordination to

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make their optimum level functionally independent.[5]

Balance is a condition in which all forces acting on the body are balanced so that the centre of mass is within the boundaries of base of support[7].

Balance has two types, static balance and dynamic balance[8].

Static balance: The ability of a person to maintain an upright posture and keep the line of gravity within the limits of the base of support[8].

Dynamic balance: The ability of a person to maintain stability during weight shifting and while changing the position.

METHODOLOGY

The literature search for the relevant journal was carried out by referring through many databases cochrane, web of Science, Embase, PEDro, Scribd, National Library of Medicine. The main emphasis was given to the RCTS clinical trial and systemic review to examine the effectiveness of exercise in improving balance and coordination among stroke survivors.

Table -01

	Inclusion	Exclusion
Study year	2014 to 2023	Before 2014
Study design	Randomize control trial, meta - analysis , cross sectional study, clinical control trial, Experimental study	Survey, coherent study, manuscript, ROL, dissertation
Setting	Government hospital IPD, rehabilitation centre , indoor rehabilitation center	OPD, non - rehabilitation centre, non -healthcare centre
Context	Progressive resistive exercises, core stability strengthening, task specifi c training , visual restriction exercise, lower limb muscle activation , sit to stand balance training with TENS. gait traini ng, Swiss ball exercise	
Outcome measure	Berg balance test, functional independence measure , trunk impairment scale, functional reach test, postural assessment scale, Lazer guided digital goniometry Barthel index, four square step, five time sit to stand, fugl Meyer scale, MAS, MMT	Visual analog scale, global disability scale, stroke disability scale

Data extraction and analysis

4 reviewers independently completed data extraction and review the information extracted on the following study characteristics.

1. Research aim
2. No. of subject included
3. Research aim
4. Result

Table -02

The characteristics mentioned above are summarised in table

s. no.	Characteristics	Author	Country	No of subjects involved	Type of research	Conclusion
1.	study aim to compare effect of balance training on an unstable surface with balance training under visual deprivation condition	Shima JANDAGHI, Nahid TAHAN, Alireza AKBARZADEHBAGHBAN	IRAN	Total 60 patient, 15 patient excluded due to exclusion criteria. Group g1 =15 patient (visual deprivation with stable base training, grp g2 =15 patient (visual deprivation with unstable base training with open eye , grp g3 =15 control group	Clinical control trial	Author concluded that patient who receive balance training in vision restriction condition could improve the balance more than training at free vision condition
2.	Investigate the effect of task specific training on trunk control and balance	Mohammad E Khallaf	Giza Egypt	Total 34 patient, Study group g1(task specific training on mrp) for 10 weeks =17 Control group G2 (conventional PT) on NDT for 10 weeks=17	Randomise control trial	Task specific training May be effective in Improving the static and dynamic postural and trunk range of motion among subacute stroke patient.
3.	Effect of Swiss ball training and conventional physiotherapy to improve balance and mobility in post stroke patient	Kanika D. Muniyar, Shrikant B. Darade	Nanded Maharashtra	Total no of patient =40	Randomise control trial	Author concluded that Swill ball exercise have greater effect compare to conventional therapy for balance training.
4.	Effect of sling exercise therapy on balance , ADLs in stroke patient	Jing Liu, weibinf feng , jun zhou	South china, hengyang , hunan ,china	Total no of patient = 50, study group =25 (sling exercise), control group =25 (conventional therapy) Four weeks	Randomize control trial	Sling exercise therapy has been shown to be a safe and effective method to improve balance, mobility and ADLs in stroke patient.
5.	Effect of bad ragaz ring method on muscle activation of lower limb and balance ability in chronic stroke	Hyun-Gyu Cha , Young Jun Shin , Myoung Kwon Kim	Daejeon Korea	Total no of patient 50, 28 patients excluded, experimental group =11 patient (bad ragaz ring method exercise), control group =11 (neurodevelopment technique)	Randomised controlled trial	Bad ragaz ring Method may be Beneficial for improve Balance, muscle activation in chronic stroke patient.

6.	Determine effect of Augmented reality based postural control training improve gait function in patient with stroke	Chi-Ho lee , Yumi Kim , byoung Hee lee	Korea	Total no of patient =21 Study group=10 (AR exercise), control group =11	Randomised controlled trial	Augmented reality based exercises are effective to improve postural control training and balance.
7.	Evaluate the effect of compelled the body weight shift therapy on weight bearing symmetry and balance in post stroke patient	Jeba Chitra, Siddhart h Mishra	Belgaum, Karnatak a	Experimental study	Total no of patient =22	symmetrical weight bearing balance can be improve for batter ambulatio and reduce fall Of risk
8.	Determine the efficacy of exercise administered to stroke patients with a balance trainer	B Ordahan, A Y Karahan, A Basaran	Konya turkey	Total no of patient =50 Study	Randomise control trial	Author concluded that balance and postural Control exercise with balance trainer is enhance the balance training compare to without balance trainer.
9.	Evaluate difference between the hemiplegic stroke patient who have undergone physical therapy treatment in contrast to those patients who have not taken any physical therapy.	Sania Maqbool , Rabia jawa tayyaba Sattar	Lahore, Pakistan	Total no of patient = 40 Control group =20 (who have not taken any type of physical therapy), experimental group = 20	Cross sectional study	Patients who actively Participated and perform Regular exercise of initial bases have fast recovery Rate
10 .	Determine effect of sit to stand exercise with TENS in balance training		Korea	Total patient = 40	Randomise control trial	Author concluded that Effect of sit to stand Exercise with TENS is more beneficial compared to only sit to stand exercise balance exercise

DISCUSSION

1. Shima JANDAGHI, Nahid TAHAN, Alireza AKBARZADEH author showed improvement in balance, in response to visual restriction exercise, in this trial author were taken 60 subjects then they divided these 45 patients into 3 groups, g1 =15 patient who treated by vision deprivation stable base training (VD SBT) weight shifting, g2 =15 subjects who were receive balance training on firm foam (UBT) with eye open, g3 controlled group receives general physiotherapy exercises. every exercise contains 4 sets in 30 minutes with 1 minute rest interval between each set, this intervention continued for 1 month and 3 sessions per week. by doing this clinical trial author concluded that the VD SBT group showed more improvement (by improvement in proprioception) compared to UBT with eyes open and conventional therapeutic exercises.

2. **Mohamed E. Khallaf 17 November 2020,** the effect of task-specific training on trunk control and balance in patients with stroke. This was a randomise control trial in which the author took 46 subjects, 12 subjects were excluded due to the author s exclusion criteria. The author divided 34 subjects into 2 groups 1st was study group g1 17 subjects were treated with task-specific training, 60 minutes per session, 3 times per week for 10 weeks. 2nd group was controlled group g2 was treated with conventional physiotherapy by Bobath approaches 60 minutes per session, 3 times per week for 10 weeks. By doing this controlled trial author concluded that task-specific training is more effective to improve static, dynamic postural balance control and increase range of motion among subacute stroke survivors.

3. **Kanika D. Muniyar, Shrikant B. Darade et al 2018** Conducted a

randomized control trial, in which the author assigned 40 subjects to the study group, author pre-assessed subjects by BBS and TUG scales. study group who were treated by Swiss ball training (supine, prone exercise, trunk rotation, Swiss ball core stability enhancement, Swiss ball balance, and coordination exerciser) and conventional physiotherapy including stretching, and strengthening exercises, 3 to 5 times per week for 6 weeks, after completing the intervention, author post assess the subjects And concluded that Swiss ball training and conventional physiotherapy have a greater and more positive impact to enhancing balance and mobility in post-stroke survivors.

4. **Jing Liu, Webbing Feng, Jun Zhou et all in April 2020** were done a randomized control trial in which author took 50 subjects and divided them into 2 groups, The study group kept 25 subjects who were treated by sling exercise therapy using a suspension device and the control group kept 25 subjects who were treated by conventional physiotherapy. This intervention applied for both groups for 4 weeks, every week 5 times, per session 30 minutes. Before applying the intervention, author was pre-assessed and after completing the 4 weeks of intervention post assessed the study and control group by BBS, Fugl Meyer scale. and after measuring scales, the author concluded that sling exercises are safe and effective in improving balance and ADLs.

5. **Hyun Gyu Cha, Young Jun Shin, Myung- Kwon Kim, et all 2017**were conducted a randomized controlled trial in which the author screened 50 subjects for the trial, 22 subjects' inclusion criteria, so the author divided 22 subjects into 2 groups, the experimental group has 11 subjects who treated by aqua therapy and comprehensive rehabilitation therapy, control group have 11 subjects who treated by only comprehensive rehabilitation therapy. these interventions were done for 6 weeks in both groups. according to the author bad Ragaz ring method improves the activation of the tibialis anterior and gastrocnemius which improve the balance Before applying the intervention, after applying intervention author pre-assess and post assesses the patient by measuring scale - fugl Meyer scale, berg balance scale then the author concluded that the bad ragaz ring method may be beneficial for improving balance and muscle activation in chronic stroke.

6. **Chi-Ho Lee, Yumi Kim, Byoung- Hee Lee et all in June 2014,** conducted a randomized control trial in which the author assigned 21 patients, and divided them into 2 groups, experimental group =10 patients (treated by AR-based postural control Exercise, and general physical therapy program), control group =11 patients (who were treated by general physical therapy. Interventions were given for 30 minutes per session, 5 days per week for 4 weeks. Before and after the application of intervention authors pre-assessed and post-assessed the experimental and control group by time go and up test, berg balance scale. after measurement of the outcome author concluded that this experimental study provide evidence in support of incorporating an AR environment into postural control training for improving the gait of stroke.

7. **Jeba Chitra, Siddharth Mishra et all in 2014** conducted an experimental study, in which the author assigned 22 patients to the study group. 22 patients came into the inclusion criteria, The author pre-assessed the patients by Berg balance scale, functional independence measurement scale , before applying intervention, the author asked patients to insert the 10 mm insole above the footwear of the unaffected limb and advised to wear it throughout the day and then give to patient conventional physiotherapy (including strengthening of hip extensor abductor ,adductor ,knee flexor, extension , ankle dorsi flexor using weight, wall squats, bed mobility exercise, wobble board exercise). this intervention was given 1 hour per day for 2 weeks. After completing the 2-week duration the post assessed the patient by Berg balance scale and concluded that compelled body weight shift therapy with conventional physical therapy will improve the balance with asymmetry of post stroke patients.

8. **B. Ordahan, A Y Karahan, A Basaran, et all in 2017,** conducted a randomized control trial, in which the author took 50 patients, and divided them into 2 groups, experimental group = 19 who received (range of motion exercises, balance, coordination and postural exercise and walking training) for 20 minutes a day, 5 days weeks, 6 weeks and conventional group =31 who were treated with warm-up and strengthening, balance and endurance exercise for same experimental group for 5 weeks and then author post assess the participants and concluded that balance and postural training with balance trainer enhance the output of intervention compare to without balance trainer training.

9. **Sania Maqbool, Rabia jawa, tayyaba Sattar et all 2022** conducted a cross-sectional study, in which the author assigned 40 patients, then divided into 2 group, a conventional group =20 patients who had not undergone physical therapy, an experimental group = 20 patient In experimental group,12 patients received 1st month of therapy, 5 patients received 2nd month of therapy, 3 patients received 4 months. The author pre-assessed and post-assessed the patient with the Brunel balance assessment before and after applying the intervention. The author concluded that patients who actively participate and perform regular exercise on an initial basis have a faster recovery rate.

10**. Kyoung- sim Jung, tae sang, hwi- young Cho et al in 2017,** conducted a randomized control trial, in which the author assigned 40 subjects, assessed both groups experimental groups =20 patients (who were treated by sit to stand training with TENS), control group= 20 (who treated with only sit to stand training). Both groups were treated by this intervention for 15 min. 5 times per week for 6 weeks. After completing the intervention author post-assessed both groups and concluded that sit-to-stand with TENS reduces spasticity and promotes sit-to-stand balance training in post-stroke patients.

CONCLUSION

After analysis of all above mention various study, we concluded that balance training with vision restriction, sling exercise, task specific training, sit to stand exercise with tens, trunk control exercises are more effective to improve balance ability.

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