ORIGINAL ARTICLE

Swiss ball exercise post-stroke with hemiparesis to improve mobility: a randomised controlled trial

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ABSTRACT

Introduction: This research was done to find out how well post-stroke therapy works in reducing side effects and improving patient mobility.

Materials and Methods: This study used a randomised control trial design involving 42 post-stroke patients (mean 40 days after onset) with hemiparesis from January to October 2022, who were separated into two groups and randomly allocated to either the experimental group (n=21) or the control group (n=21). The intervention group received 24 times Swiss Ball Exercise (SBE), and the control group received 24 times conventional therapy.

Results: We found for the intervention group using SBE on TUG (p<0.001), TIS (P<.001), FTBS (p=0.011), DGI (p=0.005) and RMAB (p<0.001).

Conclusion: After a stroke, patients with hemiparesis who exercise on a Swiss ball experience improved body function and movement.

KEYWORDS:
Hemiparesis, mobility, stroke, Swiss ball exercise

INTRODUCTION

Non-communicable diseases are now more common than they were 3 years ago. In 2018, there were an anticipated 2.1 million more stroke cases or a rise of 10.9%.[1] Balance issues, such as muscle weakness, decreased soft tissue flexibility and sensory-motor control, can be caused by sensorimotor disorders, which can also cause sensory disturbances, abnormal muscle tone and sensory disturbances.[2] Physical, emotional, psychological, cognitive and social factors are all present in these conditions.[3] Long-term physical restrictions in patients make them dependent on their families for assistance with daily activities.[4] Stroke survivors have a high rate of long-term disability, and neuro-rehabilitation remains an important component of post-stroke care. Clear standards of care have been created in numerous nations to improve the delivery of both inpatient and outpatient stroke services. Research demonstrates that functional recovery is predictable in the initial days following stroke, despite the fact that recovery differs among stroke patients. Swiss ball exercise (SBE) is one of the approved treatments. SBE is exercises using a ball aimed at reducing back pain, by increasing the strength of the abdominal muscles, gluteal muscles, and back extensor muscles. The study's findings demonstrate that SBE is the most efficient technique for enhancing post-stroke patients' balance and mobility.[5] This study's objective was to show how SBE improved post-stroke patients' levels of mobility and balance.

MATERIALS AND METHODS

In this study, post-stroke patients were the participants of a randomised control trial design with a control group that performed tests before and after the study. The sample for this study was collected using the consecutive sampling method, and the inclusion criteria were acute post-stroke patients who had hemiparesis of the upper and lower limbs for a period of 1–3 months, were aged 40–60, both male and female, and have sensory and motor abnormalities. Patients with cognitive deficits, mental illnesses, a history of spinal surgery, spinal deformity or haemorrhagic stroke were excluded from the study. Forty-two people were divided into two groups which became the research sample, as can be seen in Figure 1.

The first group engaged in SBE for 35 to 40 minutes 1 time, the exercises were done 6 times a week for 4 weeks. The physiotherapist is in charge of all treatment sessions. SBE consists of 1) Reducing the frequency of assistance, 2) Increasing arm ability, 3) Advancing the balance limit 4) Increasing Hold time. The Times Up and Go Test (TUG) and the Trunk Impairment Scale (TIS) were used to assess truncal function after 3 months. To clarify the results of the key end measures, tests such as the Berg Balance Scale, Four Test Balance Scale (FTBS), Dynamic Gait Index (DGI) and Rivermead Motor Assessment Battery (RMAB) were conducted to find out the increase in mobility. This research has also passed an ethical test through the health research ethics committee with number 099.6/II.3.AU/F/KEPK/V/2022.

The pre-and post-treatment results were reported as the "time" variable among the participants, whilst the experimental and control groups were regarded as the "condition" factor between people using a t-test analysis. If the Time Conditions indicated a significant interaction, there was a significant difference between the pretreatment and post-treatment evaluations for the two groups. For the TIS and its subscales, the Bonferroni correction was applied to probability scores. For the key outcome measures listed in

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Table I: Characteristics of respondents (N=42)

	Intervention		Control	
	f	%	f	%
Age				
31–40 years old	3	14.2	5	23.8
41–50 years old	6	28.6	6	28.6
51–60 years old	8	38.1	8	38.1
> 60 years old	4	19.1	2	9.5
Gender				
Man	13	61.9	11	52.4
Woman	8	38.1	10	47.6
Long suffering stroke				
< 1 year	6	28.6	4	19.1
1–2 years	12	57.2	11	52.4
2–3 years	3	14.2	6	28.5
Paretic side				
Right	12	57.2	11	52.4
Left	9	28.6	10	47.6
Type of stroke				
Ischaemic	14	66.7	11	52.4
haemorrhagic	7	33.3	10	47.6

Table II: Outcome measures of the respondents (N=42)

	Pretreatment		Post-treatment		*p*-value	
	Intervention	Control	Intervention	Control	Time	Time * Condition
TIS						
Static sitting balance	5.42 (1.69)	4.92 (2.14)	7.05 (0.01)	6.38 (2.32)	<0.001	1.000
Dynamic sitting balance	3.78 (1.77)	3.98 (1.83)	8.55 (2.31)	5.11 (1.87)	<0.001	<0.001
Coordination	0.76 (0.71)	0.72 (0.58)	3.61 (1.52)	1.45 (0.93)	<0.001	<0.001
Total	9.96 (4.17)	9.62 (4.55)	19.21 (3.84)	12.94 (5.12)	<0.001	<0.001
Romberg						
Eyes open	18.57 (14.75)	14.96 (14.68)	24.82 (10.12)	20.12 (12.32)	0.002	0.746
Eyes Closed	14.01 (13.14)	9.98 (14.62)	23.30 (12.49)	13.25 (13.21)	<0.001	0.356
FTBS	1.59 (1.46)	1.52 (1.86)	4.25 (1.43)	2.65 (2.01)	<0.001	0.011
DGI	4.72 (7.51)	4.06 (7.54)	13.71 (10.62)	6.13 (8.52)	<0.001	0.005
RMAB						
Gross function	4.76 (4.22)	4.26 (4.32)	9.91 (2.82)	6.18 (3.98)	<0.001	0.001
Leg and trunk	3.16 (2.76)	3.12 (2.47)	9.21 (1.44)	4.78 (3.54)	<0.001	<0.001
Arm	3.12 (4.31)	3.08 (4.01)	6.09 (5.37)	5.11 (5.32)	<0.001	0.412
Total	11.04 (11.29)	10.46 (10.8)	25.21 (9.63)	16.07 (12.84)	<0.001	<0.001
TUG	2.54 (2.48)	2.14 (2.01)	4.33 (4.28)	3.01 (2.97)	<0.001	<0.001

TIS: Trunk Impairment Scale, FTBS: Four Test Balance Scale, DGI: Dynamic Gait Index, RMAB: Rivermead Motor Assessment Battery

Table II, the significance level was established at p=0.007 at a level of significance of p=0.05. For some experiments, secondary outcome measures were not adjusted.

RESULTS

Each of the treatments and control groups received 21 stroke patients. In both the intervention and control groups, all patients underwent 24 treatments. The characteristics of the two groups can be seen in Table I. When comparing the two groups' demographic characteristics and stroke-related data, we did not find any differences. Both groups experienced significant improvement for 4 weeks after therapy can be seen in Table II.

DISCUSSION

We found that 24 additional treatments over 4 weeks with an average duration of 35 minutes improved truncal function and mobility in post-stroke patients. This therapy also improves postural control while the patient is standing.[6] This shows that SBE is important for the rehabilitation of stroke patients.[7] This is also the same as other studies, which explain that therapy to stimulate truncal function is very important and requires regular exercise. Higher truncal levels were obtained because of longer exercise.[8]

SBE also improves balance and sitting and standing exercises as can be seen in table II. These results are the same as research conducted by Lee in 2022, exercises carried out as soon as possible will increase mobility.[8,9] The motor methods stimulated by this exercise are effective and efficient. All patients are subjected to the exercises by the therapists engaged in direct activities.[10] Truncal stability is an important point of exercise because it maintains function stability and coordinated use of the extremities.[11] This exercise also stimulates the reduction of weakness experienced by the

patient. This therapy also improves coordination between joints in the bones of the extremities.[12] SBE can be an alternative therapy to increase the mobility of post-stroke patients at a low cost. further research is needed with a larger sample by combining several therapies to see more impact. during observation, patients who were younger or with an average age of less than 41 years experienced a better increase in mobility, and that occurred in men. patients who were more enthusiastic about doing the swiss ball exercise and seemed to have a higher motivation to recover also experienced a drastic increase. this becomes the basis for further research related to the motivation of each post-stroke patient in undergoing treatment. This study has weaknesses, namely in analyzing data on the characteristics of respondents still using categories and the intervention was only carried out for 4 weeks, better research results might be obtained.

CONCLUSION

SBE increases truncal function. This exercise also influences balance and increases mobility from a sitting and standing position. Further development is needed for other, more specific interventions.

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