

# Balance and Stability—Focused Exercise Program Improves Stability and Balance in Patients After Acute Stroke in a Resource-poor Setting

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**Objective:** To compare the effect of a balance and stability—focused outpatient community-based rehabilitation and a regular physiotherapy program on balance, stability, and perceptions of improvement after acute stroke.

**Design:** A randomized controlled trial in a community-based therapy center.

**Participants:** Fifty consecutive patients with a first stroke, who reported to a community-based therapy center over a 7-month period were allocated to the control group (regular physiotherapy) or the experimental group (balance and stability—focused rehabilitation).

**Intervention:** A program of physiotherapy focused on balance and stability exercises. The control group received the regular physiotherapy program.

**Main Outcome Measurements:** The Postural Assessment Scale for Stroke Patients (PASS) and the Berg Balance Scale (BBS) monitored stability and balance. The normalized data (PASS and BBS) were analyzed by using analysis of covariance. Qualitative data were thematically described.

**Results:** Internal consistency of baseline PASS and BBS scores was high (Cronbach  $\alpha$ , .964 and .974, respectively). PASS overall pretest scores increased from  $21.96 \pm 21.41$  (mean  $\pm$  standard deviation) and  $21.52 \pm 8.43$  to  $67.67 \pm 28.42$  and  $80.16 \pm 22.60$  posttest in the control and experimental groups, respectively. Posttest scores were significantly different ( $P = .004$ ). The effect size was medium (.490). The overall BBS scores showed overall mean (standard deviation) increases from  $44.71 \pm 22.24$  and  $43.43 \pm 17.11$  pretest to  $48.71 \pm 23.18$  and  $59.71 \pm 18.20$  posttest for the control and experimental groups, respectively. The effect size was considered medium (.532).

**Conclusion:** The balance and stability—focused community-based rehabilitation program was more effective in improving stability and balance in patients with stroke compared with the regular physiotherapy program in resource-poor settings.

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## INTRODUCTION

Bryer et al [1] identified stroke as the leading cause of death and disability in South Africa, with the potential to further increase due to increased exposure to risk factors. In the same country, Bradshaw et al [2] noted that almost 13% and 18% of men and women, respectively, over the age of 65 years die from stroke. Stroke patients who survive experience varying degrees of loss of function. The loss of function is directly related to the degree of impairment resultant from the primary event. Direct consequences of brain damage and indirect consequences due to time lapse between medical treatment and rehabilitation add to the functional loss that accompanies the stroke. Impairments in stability and balance affect the ability to perform voluntary movements and function.

Balance training for stroke has received wide attention, including its effects on gait and function [3], training strategies to improve balance and stability [4-6], and feedback [7-10], all in an effort to improve function [11-14] or reduce the restrictions in participation [15,16]. The restoration of function is a function of neural plastic changes that should occur as a result of repetitive movements in functional patterns. Hocherman and

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Dickstein [4] saw the need for training to ensure improved balance in stroke patients. Physiologically, with normal human development, stability precedes mobility, and, if retraining does not follow this sequence and abnormal patterns of movement are allowed to be fostered as a means to adapt to enable function, then optimal function will not be achieved. Often, stroke survivors learn to live with the disability, which affects their participation in a variety of activities.

In many countries of the world, a shortage of rehabilitative therapists means that patients who rely on subsidized health care, and especially those who live in rural areas, are forced to be as functional as they can without expert advice or care [14,17,18]. In South Africa, in an attempt to provide access to health services to all, district hospitals serve nearby community clinics. The limited services offered to outpatients once every 2 weeks provides some access to rehabilitation. The effectiveness of these programs is not known [19,20]. The changing lifestyle adopted by South Africans is reflected in the increased morbidity and mortality associated with lifestyle-related diseases, such as cardiovascular diseases and diabetes, which culminate in stroke [21]. The burden associated with stroke has increased in the face of increased exposure to risk factors and age range at which stroke occurs [21]. Improved medical care has increased life expectancy, with the result that there now are older people in our communities, with the associated burden of care increasing.

Postural control reflected in stability and balance is important to improve independence, social participation [12], and quality of life. Although a traditional physiotherapy program focuses on the individual needs of a patient based on assessment, it may not be sufficient to improve function. The purpose of this study was to quantify the effect of a balance and stability exercise program on balance and stability in stroke patients and to compare it with a traditional program of physiotherapy. Both programs have been included in the Methods section. In addition, qualitative information in the form of actual feelings and opinions about barriers to functionality was explored. Although quality of life is an important variable in rehabilitation research, this was not explored in this study.

## METHODS

### Design

The aims of this study were achieved by using a randomized controlled trial. The population for this study consisted of all patients with stroke who reported for therapy at a community-based assessment and therapy center over a period of 7 months. The patients were diagnosed by general practitioners in private practices and physicians at public clinics or hospitals.

### Population

The sample was a consecutively selected subset of the population who presented to the center for the period of 7 months from the date on which ethics approval was obtained. Only patients who had a first stroke as diagnosed by a medical physician, were cognitively functional with or without communication impairment, and signed fully informed consent forms were included in the computer-generated randomization process for inclusion in either the control group or the experimental group. Patients were excluded if they had had more than 1 stroke, had any previous lower limb fractures, or were unable to participate in low-intensity exercise programs due to severe complications from comorbidities or were positive for human immunodeficiency virus, due to its neurologic sequelae.

### Setting

The community-based assessment and therapy center is a state-run facility that operates as a satellite of a district hospital also located in the community. This outpatient facility operates 5 days a week, from 7:30 AM to 4 PM. The facility serves patients from a prescribed area, and patients are referred via one of the provincial hospitals, clinics, or nearby general practitioners. The physiotherapy program for patients with stroke is an individualized 1-hour session offered once every 2 weeks, which comprises individual therapy by therapists or standardized group therapy administered by therapists or assistants. Patients who are mobile, either with or without an assistive device, and who require minimal individual attention are treated in the stroke group. At the end of each session, each patient is given his or her next appointment date. To reduce variability in this study, the participants in both groups received individual treatments by a therapist. All the patients were requested to perform the exercises at home.

### Sample

A sample size (50) that was logistically practical for implementation in the specific setting given the constraints of the availability of participants was identified. The therapy center appointment book for stroke patients at the physiotherapy department was used to identify patients for recruitment. All patients were screened by using inclusion and exclusion factors. Twenty-five patients were randomly allocated to each of the control and experimental groups. The control group received the regular physiotherapy sessions (Table 1) offered by the facility for 30 minutes with 3 breaks of 2 minutes every 10 minutes in each session. The experimental group was rehabilitated by using the intervention program that focused on the stability and balance exercises (Table 1). The duration of exercise session and number of breaks were the same for both groups.

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