

12-Week Supported Stationary Walking as a Panacea to Speed and Muscular Endurance in Hemiparetic Stroke Patients in Birnin Kebbi, Nigeria

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Abstract

The study investigated the effect of 12-week supported stationary walking on speed and muscular endurance on hemiparetic stroke patients in Birnin Kebbi. A pre-test and post-test experimental control design was used for the study. A total of thirty-two (32) hemiparetic stroke patients were purposively recruited as experimental group (n=16) and control group (n=16) respectively. Data collection instrument used were electronic treadmill, digital sphygmomanometer, stop watch, weighing scale, 10-meter walk test and 6-minutes shuttle walk test. Participants joined training session progressively for 30 minutes per day, 3 days per week for 12-week at 50-80% of subjects' maximal heart rates. Mean and standard deviation was used to calculate subjects' physical characteristics while independent t-test was used to analyze data on dependent variables of interest to the researchers (speed and muscular endurance). Results demonstrated significant effect on speed and muscular endurance with the value ($t=38.64$ $df=30$ $P<0.05$ and $t=23.78$ $df=30$ $P<0.05$) respectively. It was therefore, recommended among others that stroke patients should be encourage to engage in supported stationary walking as a cheaper and in-expensive exercise to improve walking speed and muscular endurance.

Keywords: Hemiparetic, Supported Stationary Walking, Speed, Muscular Endurance.

Introduction

Stroke is a brain injury that occurs when a blood vessel in the brain is blocked or burst; it is the most common cause of complex disability. It is seen as the third most common cause of death with cancer and heart disease rated first and second respectively (Wolf and Kennel, 2020). According to Williams, Jingo, Matchar and Samsa (2010), approximately 90% of these suffer from persisting motor deficit leading to disability and handicap, namely dependence in their activities, impaired arm and hand function and impaired walking ability.

The word "hemi" means one sided and "paresis" means weakness. About 80% of people who have had a stroke have some degree of trouble moving one side, or suffer from weakness on one side of their bodies. This condition called hemiparesis, is most often caused by stroke and cerebral palsy; it can also be caused by brain tumors, multiple sclerosis, and other diseases of the brain or nervous system (National Stroke Association, 2011).

Hall and Brody (2019) described stationary walking as a form of low impact exercise that can improve strength and cardiovascular conditioning. Supported stationary walking has been shown to be a useful adjunct for training gait in spinal cord injured patients (Holt, 2018). This approach is being used in hemiparetic stroke patients and has proved positive effect in walking ability (Hesse, Bertelt, Schaffrin, Malezic and Mauritz, 2016). Stationary walking is also seen as one of the most convenient and effective cardiovascular exercise an individual can perform in any environment. It requires little preparation and it offers benefit to both musculoskeletal and cardiovascular systems. According to Moseley, Stark, Cameron and Pollock (2021), supported stationary walking is a conventional therapy, in which body weight is manually supported by therapist and or a walker. This technique consists of using a suspension system with a harness to provide a symmetrical removal of a percentage of the patient's body weight as he or she walks on a treadmill while the device moves or supports the patient to move his or her lower limbs. This alternative facilitates walking in patients with neurological injuries who are unable to cope with bearing full weight and is usually used in stroke rehabilitation (Duncan, Propst, and Nelson, 2017).

After stroke, about half the survivors come to have one form of disability or the other and in many cases, they depend on their family members or others for activities of daily life. As a result, they come to face psycho-social difficulties such as changes into a dependent life style, passive health management, and loss of their roles, decreased self esteem and reduced self efficacy, with degraded quality of life. Hemiparetic stroke patients find it hard to accommodate this sudden physical changes and functional disabilities. Stroke also negatively affects their physical functional level and cognitive functions with difficulty with rehabilitation process.

According to Gresham, Duncan and Statson (2019), absence of any curative therapy, rehabilitation is the most frequently applied treatment modality to improve quality of life after stroke. National Stroke Association (2011) explained that rehabilitation can help hemiparetic stroke patients learn new ways of using and moving their weak arms and legs. It is also possible with immediate therapy people who suffer from hemiparesis may eventually regain movement.

Aim and Objective

To evaluate the efficacy of supported stationary walking training on speed and muscular endurance on hemiparetic stroke survivors using supportive devices (treadmill).

Statement of the Problem

After a stroke, a hemiplegic stroke patient experiences symptoms such as weakened muscle strength, stiffness, pain, language disability, and circulation problems as well as functional problem with walking, standing up, turning around, and his/her recovery (Patterson, Forrester, Rodgers, et al. 2017).

In lieu of the afore-mentioned therefore, the present study on the effect of 12-week supported stationary walking in the rehabilitation of hemiparetic stroke patients in Birnin

Kebbi took its base from these identified problems. It is on these limitations the researcher raised the following research hypotheses for the study:

Ho 1: The 12-week supported stationary walking will not have significant effect on speed in hemiparetic stroke patients.

Ho 2: The 12-week supported stationary walking will not have significant effect on muscular endurance in hemiparetic stroke patients.

Subjects and Method

Population for this study comprised all stroke patients attending Federal Medical Centre Birnin Kebbi. 32 stroke patients were selected for the study who had had hemiplegia for six months or longer diagnosed based on Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) scanning at Federal Medical Centre (FMC) and were capable of independent indoor walking a supporting device, which indicates the capability to understand and follow the researcher's instructions. The participants were given an explanation of the research purpose and provided with an informed consent form prior to the study.

Experimental design of pre-test, post-test involving experimental and control groups was utilized in this study. This design was utilized to determine the changes produced between the control and experimental groups as a result of the exercise administered. The experimental group participated in the training three times a week for a total of 12-week. Each session lasted for about 30 minutes.

Sample and Sampling Techniques

Out of the total population of the 32 subjects who satisfied the inclusion criteria, purposive (judgmental) sampling technique was used to select patients into a sample size of 16. The participants were randomly selected into experimental and control groups using a ballot system of "yes" or "no" written on a paper. All subjects who picked yes were selected for the experimental group, while those who picked no were used as control group. This is in agreement with Peretomode and Ibeh (1992) who recommended that 15 subjects per group an experimental research is be valid.

Instrument for Data Collection and Procedure

Instrument for data collection for this study were; electronic treadmill for supported stationary walking, calibrated wall, gymnasium floor for walk test, 10-metre walk test to measure speed and 6-minutes shuttle walk test to measure endurance.

An approved letter from the Ministry of Health Birnin Kebbi was taken to the selected hospitals before the commencement of the study. The purpose of the study was explained to each hospital management. Two (2) trained research assistants (hospital nurses) were involved. Physiological characteristics of patients which include speed, and muscular endurance were measured before and after the 12-week supported stationary walking.

Data Analysis

The researcher used independent t-test to analyze data. The significant difference between the control and experimental groups was determined at $P < 0.05$ significance level.

Results and Discussion

This section shall be focused on hypothesis testing, presentation of results and discussion of findings;

Hypothesis 1: The 12-week supported stationary walking will not have significant effect on speed in hemiparetic stroke patients.

Table 1: t-test summary of independent sample on speed by groups

Variable (Speed)	n	m & Sd	SE	df	t	Prob.
Experimental	16	.857± 0.43	0.109	30	38.64	0.001*
Control	16	.405± 0.17	.0046			

$t = 2.04$ sig, df 30, $P < 0.05$

An independent t-test was calculated to compare the mean of experimental scores with mean of control scores. The table revealed that, the mean of experimental scores was $.857 \pm 0.43$, and means scores of control group was $.405 \pm 0.17$. The observe t- value ($t = 38.64$ df= 30, $P < 0.05$) is greater than the table t ($t = 2.04$). This implies that the experimental group was significantly better than the control group in speed, therefore the null (H_0) hypothesis formulated was rejected, and that is to say the result cannot be attributed to chance.

Hypothesis 2: The 12-week supported stationary walking will not have significant effect on muscular endurance in hemiparetic stroke patients.

Table: II: t-test summary of independent sample on Muscular Endurance of subjects by groups.

Variable (Muscular End.)	N	m & Sd	SE	df	t	Prob.
Experimental	16	150± 9.53	2.383	30	23.78	.000*
Control	16	94.02± .909	.227			

$t = 2.04$ sig, df 30, $P < 0.05$

Comparing mean scores of the experimental group 150 ± 9.53 , and mean scores of the control group $94.02 \pm .90$, with regards to muscular endurance, (6MSWT) showed a statistically significant result with difference in muscular endurance ($t = 23.38$ df = 30, $P <$

0.05) is greater than the table t ($t = 2.04$). Therefore, the null hypothesis is rejected on the account that participants in the experimental group walked longer distance compared to their counterpart in the control group. This implies that the 12-week supported stationary walking have significant effect on the muscular endurance of hemiparetic stroke patients.

Discussion of the Findings

Walking dysfunction is the most significantly affected by a stroke. Among early stage stroke patients, 80% lose walking ability. Enhancing walking ability to restore functions and social activities of stroke patients is one of the key goals of treatment.

This study investigated the effect of 12-week supported stationary walking on speed and muscular endurance in hemiparetic stroke patients in Birnin Kebbi. The independent t -test analysis reveals an improved walking speed in the experimental group significantly above the control group ($t = 38.64$, $df = 30$, $P < 0.05$). This implies that 12 weeks supported stationary walking exercise improves walking speed in addition to gait parameters in the entire experimental group significantly above the control group. This finding is in agreement with a commentary made by Carr and Shephard (2020), that modern concept of motor learning favors task specific repetitive training. The task employed in this study is supported stationary walking which is more or less gait specific which was probably why significant gains in speed were realized. In another related study titled "exercise capacity and cardiovascular responses to exercise in hemiparetic patients" Terai and Mike (2011) reveals that low intensity exercise like stationary walking increases improvement in locomotor tasks in chronic stroke survivors following task related training. This also could perhaps be the reason for the improvement in speed of the subjects.

Muscular endurance using 6-minutes shuttle walk test (6MSWT) was examined in which experimental group proved effective above the control group ($t = 23.78$, $df = 30$, $P < 0.05$). This indicates that 12-week supported stationary walking exercise improves endurance. This outcome is in line with study conducted by Weiss, Suzuki, Bean and Fielding (2000) who evaluated the effect of 12 weeks progressive resistance training program on muscle strength, endurance and balance in stroke survivors. The outcome of which indicated a positive finding in all the variables to increase by 68%. This study is also in agreement with a commentary made by Holt, (2018) who reported that faster walking speed improves muscle strength. This study is also in conformity with a study conducted by Sharp and Brouwer (2017) titled "Isokinetic strength training of hemiparetic knee: effect of functional spacity". They opined that therapeutic exercise programs indicated effectiveness in individuals with chronic stroke in terms of motor control and muscular strength.

Summary

This study was carried out to investigate the relative therapeutic efficacy of a 12-week supported stationary walking exercise approach in the management of hemiparetic stroke patients. Thirty-two (32) subjects with an overall approximate age of 50yrs were randomized into two groups (experimental and control). Literatures related to this topic

were reviewed under the following headings; epidemiology of stroke, an overview of hemiparetic stroke, aetiology and risk factors of stroke, menace of stroke, management of stroke patient, supported stationary walking in stroke rehabilitation, aerobic exercise in stroke rehabilitation and exercise recommendations for stroke rehabilitation to give the study a focal direction. Electronic treadmill, digital sphygmomanometer, stop watch, weighing scale, calibrated wall, 10-meter walk test (10MWT), and 6-minutes shuttle walk test (6MSWT) were the tools used to obtain data for the study. Baseline measurements of patients on dependent variables of interest on speed, muscular endurance, systolic, diastolic blood pressure and resting heart rate were taken. The experimental procedure was supported stationary walking on a treadmill for 12-week, three times per week with each session lasting for 30 minutes including warm-up and cool down activities. Post-training measurement was taken after the 12-week training program. Independent t-test was used to test all the stated hypotheses at 0.05 level of significance. The outcome of the study demonstrated that the 12-week of supported stationary walking exercise was sufficient enough to improve speed and muscular endurance of hemiparetic stroke patients.

Conclusion and Recommendations

This study is designed to check whether supported stationary walking, which is a low-cost and readily accessible form of exercise, is effective for improving speed and muscular endurance in hemiparetic stroke patients. Following the outcome of this study the researcher concludes that, the 12-week supported stationary walking improve significantly the speed and muscular endurance of hemiparetic stroke patients. Therefore, supported walking exercise is an effective modality for managing chronic stroke patients with hemiparetic gait disturbance. Therefore, the following recommendations were raised:

- Individuals, organizations and stroke patients should be encouraged and enlightened to on the efficacy of supported stationary walking exercise and to be seen as a cheaper and in-expensive means of improving speed and muscular endurance of stroke survivors.
- Therapists should encourage hospital management to make electronic treadmill available for the benefit of stroke patients especially where the main intention is patients' walking ability and muscular endurance.

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