

Comparison Between Effects of Rhythmic Auditory Stimulation and Dual Task Training in Gait and Balance in Sub-Acute Stroke Patients

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Abstract

Background: The aim of this study was to investigate effects of Rhythmic auditory stimulation and Dual-task training on gait & balance in subacute stroke patients in order to suggest new therapeutic intervention that would help subacute stroke patients to improve their activity of daily living, As the ultimate goal of most rehabilitation programs is restoration of human movement or gait and improve QOL.

Method: This study was hospital-based, randomized control trial. Forty-five sub-acute stroke patients were randomly allocated in 1 of 3 groups RAS (n=15), DTT (n=15) and Conventional Therapy (CT) (n=15) respectively. Patients in RAS and DTT group received 30 minutes session, 3 times per week for 5 weeks for both groups respectively and conventional therapy group received 30 minutes session, 5 times per week for 5 weeks. The pre and post intervention outcome were measured quantitatively through the Berg Balance Scale (BBS), Time Up and Go Test (TUG) and Dynamic Gait Index (DGI) scale.

Result: Significant difference in clinical measures i.e Berg Balance Scale (BBS) and Dynamic Gait Index (DGI) score were observed in Rhythmic Auditory Stimulation RAS (Group-I) with conventional physiotherapy as compared to Dual Task Training DTT (Group-II) with conventional physiotherapy in improving balance and gait of subacute stroke patients.

Conclusion: This study concluded that for restoration of balance and gait training using Rhythmic Auditory Stimulation (RAS) with Conventional therapy (Group-I) is most effective rehabilitation programs in subacute stroke patients.

Keywords: Balance • Giat • Stroke • Blood vascular system • Capillaries

About the Study

Stroke in India, poses a major public health challenge [1-4]. Hemiplegia is one of the most common impairments after stroke and the most striking symptoms of stroke patients are limb weakness and disturbed gait patterns. In particular, gait restoration and improvement of walking are highly relevant for the social and vocational reintegration. Balance is another component that seems to be affected in patients with stroke [5-8]. For this reason, one of the primary goals of rehabilitation for stroke patients is to restore mobility through gait training [9-11].

Rhythmic auditory stimulation is one of the neurological therapeutic methods that have physiological effects in rehabilitative exercise therapy which improves movement control [11]. Consistent with the mechanism whereby oscillatory movement can be

synchronized to regularly paced external cues, repetitive rhythmic cueing mediates motor control and facilitates execution of expected motor responses. Additionally, Rhythmic auditory stimulation is cheap, viable, easy to follow [12]. One of the recent developments in the past few years for gait rehabilitation in patients with stroke is the use of Dual-task training. The dual task is defined by the simultaneous production of two tasks, one called "primary" & the other called "secondary", where performance changes are measured [7]. In light of the current evidences in support of the efficacy of dual task training it is evident that it was feasible to implement individual dual-task training, combining traditional intervention with a variety of neurological diagnosis and it has been found to be helpful in balance and gait rehabilitation of patients with stroke however till date few studies have tried to analyze the relative merit of dual-task training in both gait & balance of stroke survivors. Minimal comparative research have been conducted on the extent of improvement among

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the Dual-task training and Rhythmic auditory stimulation. Accordingly, this research investigated the changes occurred in terms of gait & balance when Dual-task training & Rhythmic auditory stimulation training were conducted in subacute stroke patients.

A Randomized controlled trial (RCT) in MGM Medical College and Hospital Aurangabad and other Multispecialty Hospitals in Aurangabad on 45 subacute stroke patients by block sampling for 1 year duration. Study subjects of both gender diagnosed subacute stroke. Inclusion Criteria was Subacute Stroke Patients (7 days to 3 months), Those who did not have a cognitive impairment with Mini-Mental State Examination (MMSE) scores of 24 or higher, adequate vision and hearing for completion of the study protocol, ability to walk with or without aid for at least 10 meters, no sensory problems that affect walking ability. Exclusion criteria was Any Heart Disease or Uncontrolled hypertension, any neurologic disease except for the first stroke and significant orthopedic or chronic pain conditions affecting gait performance.

The study was a Quantitative study and outcome measures used for intervention were Balance, Gait independent variables and dependent variables. Time Up and Go test (TUG) Cadence, Stride Length, Dynamic Gait Index scale (DGI) Balance, Gait Speed and Berg Balance Scale (BBS) Balance (change on outcome measure from baseline up to 5 weeks of intervention).

The purpose of the study was explained, the subjects were screened based on the inclusion criteria & exclusion criteria. A written informed consent had been obtained & clear explanation was given about the procedure done for clinical assessment and treatment. Demographic data, MMSE, BBS, TUG and DGI were collected at pre and after post-treatment [12].

Randomly allocated into three groups (Rhythmic Auditory Stimulation, Dual Task Training) and control group (Conventional Therapy) with equal number of patients in each group. In group-I, a smartphone ZyMi metronome application which is provided free of charge for the Android operating system was used for provision of Rhythmic Auditory Stimulation.

In the trial, session patients were instructed to walk 5 Rounds of 5 meter course repeatedly to adapt to the beat of the metronome according to their walking speed. Intervention: Patients performed dynamic balance and gait training on the metronome beat 10 repetition of each exercises as mentioned in conventional therapy and walked 5 Rounds of 5 meter course forward, backward, sideways, obstacles walking and stair climbing and progressed according to the patients recovery. The intervention was given by primary investigator for 30 minutes, 3 times per week for 5 weeks, 15 session.

Modern casting media are cuttable into slices by razor blades can be frozen in distilled water and thereafter sectioned by a mini wheel saw or they can be micro-dissected using fine tipped insect pins to expose and re-examine individual vascular territories layer by layer in consecutive SEM sessions.

For studies of vascular patterns, qualitative data is often enough. Quantitative data on vessel diameters, inter-branching and inter-vascular distances as well as branching angles are needed for hemodynamic calculations of interesting vascular territories. This data can be gained by 3D-morphometry of stereo paired scanning

electron micrographs. Data gained allows insights into hemodynamic properties of individual vascular segments like wall shear stress. Moreover, these data enable to test real vascular networks for optimality principles.

In biological research blood vascular systems of individual organs or tissues can be studied on a phylogenetic or an evolutionary scale. In these studies, similarities/dissimilarities in origins, courses, branching patterns and areas of supply or drainage of individual vessels are in focus aiming to understand how the blood vascular system maintains blood supply under altered needs according to functional changes of individual tissues and organs. Beyond this, SEM of Vascular Corrosion Castings (VCCs) elegantly allows to locate flow regulating structures, such as muscular sphincters, flow dividers, intimal cushions, and venous valves. Furthermore, one can also study Arterio-Arterial Anastomoses (AAAs), Arterio-Venous Anastomoses (AVAs), and Venous-Venous Anastomoses (VVAs) [13].

Like other techniques, vascular corrosion casting is also prone to artifacts. Incompletely casted blood vessels impose as blindly ending vessels with rounded tips. They can be positively differentiated from broken vessels, which show straight, sharp endings, and also from sprouting vessels, which impose with gradually tapering endings. In some cases, "plastic strips" are found around vascular casts. According to their shape and rather annular structure, they are considered to represent plastified vascular smooth muscle cells or pericytes [14].

Discussion and Conclusion

The study revealed that Rhythmic Auditory Stimulation along with conventional therapy is most effective among all the three intervention. Hence it can be concluded that Rhythmic Auditory Stimulation is an effective therapeutic option along with conventional physiotherapy treatment in the intervention of subacute stroke patients.

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