

Effectiveness of Rhythmic Auditory Stimulation on Gait Parameters in Stroke Patients- An Experimental Study

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Abstract:

Objectives: Stroke is one of the leading causes of morbidity and mortality worldwide. The prevalence rates of stroke in rural areas are much lower than in metropolitan cities in India. Gait is considered as a dynamic and biological structure that sub serves locomotion and exhibits a periodic relationship among successive states of supporting limbs.

Aim: To investigate the effect of RAS on gait parameters following stroke.

Methodology: Quasi experimental study, pre and post-test design.

Procedure: Subjects were randomly selected according to selection criteria and assigned into group A and group B. Group A took conventional gait training, group B took RAS along with conventional gait training.

Conclusion: The present study concludes that group B-conventional gait training with RAS is effective than group A – conventional gait training alone.

I. INTRODUCTION

Stroke is one of the leading causes of morbidity and mortality worldwide. The prevalence rates of stroke in rural areas are much lower than in metropolitan cities in India. This is because the most affected in the age group 45-70 years, are mostly the breadwinners of the family.

Impaired walking ability is greatly contributes to the functional disability of stroke, In response to primary sensory motor impairment, secondary muscle contracture and certain adaptive motor behaviours emerge as the individual attempts to walk. These can be decrease amplitude of movement, stride length, step length, walking velocity and increase stride width, time spent in double support and uneven step,

Stroke patients who lose their normal gait have not suffered physical injuries to their legs; the area of the brain that controls movement has been damaged. In the brains of such patients, “**The internal rhythmic organizing device is damaged, but external rhythm will rehabilitate the patient**”.

For individuals who have suffered a stroke or for those dealing with neurological impairments rhythm can be used to greatly enhance balance initiation and co-ordination. Rhythm enables the patients to better co-ordinate the timing of their arm and leg movements resulting in greater control, relay on our internal sense of time.

Rhythm contained in music is an essential and significant basic element found in natural processes of life. The interconnectedness between rhythm and the human body is an important key to achieving good health. Modern day researchers discovered that there is a direct correlation between musical frequencies and brain wave patterns.

II. AIM OF THE STUDY

To find out the effectiveness of an external rhythmic auditory cue on gait outcomes in patients with stroke.

III. OBJECTIVES OF THE STUDY

To study the effectiveness of rhythmic auditory stimulation (RAS) with conventional gait training vs conventional gait training alone in acute hemiparetic stroke patients.

IV. METHODOLOGY

Study Design: Quasi- Experimental

Study Setting: In and Out patients from Apollo Hospital, S.R.M Hospital, Chennai.

Sample Size: 30 subjects.

Inclusion Criteria:

- First episode of stroke
- Age include 45-70 years.
- Both sex.
- Acute hemiparetic stroke.
- Ability to walk 10 meters without any use of walking aids or orthoses.
- Ability to understand and comprehend the instructions.

Exclusion Criteria

- Severe cognitive deficits.
- Patient with visual and hearing disturbances.
- Recent episodes of fall.
- Medically unstable patients.
- Associated neurological, cardiovascular, musculoskeletal conditions disturbing the treatment.
- Receptive aphasia and global aphasia.
- Sensory impairment primarily in lower limb.

Duration / Frequency:

Group A and group B received conventional gait training regularly 5 days a week for 4 weeks. Subjects in group B also received RAS twice daily, 30 minutes treatment sessions, 5 days a week for 4 weeks.

V. PROCEDURE

Subjects were randomly selected according to selection criteria and assigned into group A and group B. Group A took conventional gait training, group B took RAS along with conventional gait training.

Subjects in the group A were given routine physical therapy for stroke patients, which include active-assisted, progressive strengthening. Conventional gait and balance training exercises for 5 days a week for 4 weeks and were given equal instructions for speed improvement.

The group B was trained in the same basic program with the addition of Rhythmic Auditory Stimulation for 30 minutes twice daily, 5 days a week for 4 weeks. A metronome provided the rhythmic auditory cue for the group B. The metronome frequency was matched to cadence of the subjects during initial 1 to 2 minutes.

The frequency of the auditory cue was then increased incrementally 5 to 10% based on ability of the individual subject each week. During the final 7mts of each treatment session, the RAS was intermittently faded out for independently carry over of the rhythm in the gait pattern of the subject.

VI. CONCLUSION

This study infer that there is a significant improvement in gait parameters (step length, stride length, base width, cadence, velocity) of acute hemiparetic stroke patient while giving gait training with RAS. RAS can be used as an intervention for acute hemiparetic stroke patients and its mandatory that attention and auditory cues as a part of treatment rather than conventionally treating hemiparetic stroke patients.

Thus the present study concludes that group B- conventional gait training with RAS is effective than group A- conventional gait training alone.

VII. LIMITATIONS OF THE STUDY

- The sample size is small.
- This term is a short-term study.
- Differences at baseline regarding important prognostic indication.
- This research lacks an improvement component: the assessment of the patient by technological means (device, signal processing etc) in order to relate the effect of treatment provided with changes in functions such as gait patterns, general level of mobility etc.

VIII. RECOMMENDATIONS

- Long term study can be done.
- Larger sample size can be done.
- Other parameters like balance and functional independent measures can be evaluated.
- A further study can be done in experimental design with the use of visual cues or biofeedback.
- Dominant and non- dominant side involvement can be analysed separately.
- Kinematics parameters can be analysed.
- Diverse sensors such as accelerometer, force transducers, goniometer and video cameras can be used to monitor the level of activity.
- Spatial, temporal and kinematics gait parameters can be measured using gait mat, footplates etc.
- Further studies evaluating the effectiveness of these interventions are needed.

REFERENCES

- [1]. **ACADEMIC MUSIC THERAPY FORUM**; Chronobiological aspects of music physiology; November 28;2000 retrieve.
- [2]. **ALDRIDGE**; The creative arts therapies in the treatment of neurodegenerative illness. Retrieved March 10,2005.
- [3]. **AMERICAN JOURNAL OF PHYSICAL MEDICINE AND REHABILITATION**; Relationship between stride length and walking rate in gait training for hemiparetic stroke patients; march 1999; 78 (2): 147-152.
- [4]. **CONCETTA M.TOMAINO, D.A., MT-BC, LCAT**; Using rhythm for rehabilitation.
- [5]. **DOUGLAS R.JEFFERY AND DAVID .C GOOD**; Rehabilitation of the stroke patients; current opinion in neurology; 1995;8:62-68.
- [6]. **EDWARD A.ROTH.MM-MT-BC**; Rhythmicity and brain function towards a scientific model of music therapy; (1999).
- [7]. **EUN-MI-EMILY KWALE,MME,MT-BC,NMT**; Effect of RAS on gait parametrs in children with spastic cerebral palsy.
- [8]. **ISABELLA PEREZ AND ROBERT J.ZATORRE**; Brain organization for music processing ; Annual review of psychology volume 56;2005;pp 89-114.
- [9]. Incidence and prevalence of stroke;stroke preview; arrero product monograph; 2006.
- [10]. **KARLA L, DALE P, CROME P**; Improving stroke rehabilitation; stroke 1993; vol 24; 1462-1467.'