

Comparison Of Activity Limitation And Participation Restriction Status Of Individuals With Right And Left Cerebral Hemisphere Stroke

Amandeep Singh, Rajneet Kaur Sahni, Harpreet Singh

Baba Farid University of Health Sciences,
Village Khokhar, Dist. Ropar, Punjab, India, PH-0091 9779685691
adsingh88@gmail.com

Baba Farid University of Health Sciences,
Sarabha Nagar, Dist. Ludhiana, Punjab, India, PH-0091 9988353630
rajneetsahni@gmail.com

Baba Farid University of Health Sciences,
Village Khokhar, Dist. Ropar, Punjab, India, PH-0091 9914141710
ricky.4380@gmail.com

Abstract: Stroke has become one of the leading cause of mortality and long term disability in developing World. Many advances have been made in Stroke prevention and management; however, stroke continues to be a prevalent and burdensome condition affecting individual's family and society at large. Large quantity of people are surviving and returning to community. In humans both cerebral hemispheres are important for purposeful movement, which are required in activities of daily living and participation in community. Keeping this in mind the purpose of the study is to find out whether hemispheric difference reflects measure of level of activity limitation and participation restriction as outcomes in stroke patients.

Keywords: Activity Limitation, Participation Restriction, Quality of Life; Stroke, Cerebral Hemisphere

1. Introduction

Stroke has become one of the leading cause of mortality and long term disability in developing world. The cause of disability is multi factorial in its determination. Many advances have been made in stroke prevention and management, however, stroke continues to be a prevalent and burdensome condition, particularly among the elderly, but now gaining momentum in occurrence among the young too [1]. Stroke is one of the most common life threatening neurological disease and is one of the main cause of long term disability in adults worldwide. Over years, stroke has become major health problem in India. The prevalence of stroke in India was estimated as 203 per 100,000 populations above 20 years, amounting to a total of about 1 million cases. The effects of stroke are variable depending on location of the lesion as well as the size. The most typical symptom of stroke is hemiparesis or hemiplegia, which ranges from weakness to full paralysis of the body opposite to the side of the lesion, affecting the person's activities of daily living and community participation [2]. Since, stroke does not only influence person on a pathophysiological level, but is extended beyond its medical characteristics which alters the persons overall health condition. The influence of a stroke on the functioning of patients can be understood using the International classification of functioning, disability and health (ICF) as conceptual model. This conceptual model or classification not only acknowledges the dysfunction or deviation of bodily function and structure in the form of impairments, but encapsulates the burden of activity limitations and participation restrictions experienced by the patients in his or her unique architectural, social and attitudinal environment required in various life situations [3]. Furthermore, this framework allows the underpinning of key novel contributions of the contextual factors on the functioning of the patient, which is essential for context

specific rehabilitation interventions [4]. As the understanding of disability evolved over time, so has the term rehabilitation, which is loosely defined as the strategy to address disability through discipline specific interventions and the collaborate efforts of different governmental sectors [5]. Within the last three decades there have been a divergence of rehabilitation from its approach being grounded within the medical model of disability to the so called bio psycho social model, thus rehabilitation towards addressing outcomes important to the service user (which are often related to functional abilities and occupational duties) have become pivotal. These functional abilities have become the reference framework against which meaningful outcomes for the patients are measured, and the impetus for the provision of rehabilitation services along the continuum of care, and not just intermittently on an inpatient basis [3]. The literature suggests that community dwelling individuals with stroke usually experience difficulties with self-care activities and mobility tasks. The latter has also been found to predict community reintegration and return to work. As these limitations continue to persist along the chronic stages of the stroke, it has become important to quantify and address these limitations with best possible efforts. This would also help patients presenting with similar limitations and also provide a coherent argument against the content, intensity and contextually appropriateness of the rehabilitation interventions [6]. In order to systematically and objectively address these issues a comprehensive and patient specific rehabilitation practices are currently the desired approach for addressing patient problems and for optimizing functioning in all spheres of human functioning. To achieve the desired level of functioning, factors predictive of outcome should be determined and counteracted by appropriate services or processes [7]. Studies investigating the factors influencing outcome reported that personal factors such as age, gender,

severity and etiology of injury may provide an indication of prognosis for recovery. Apart from personal factors influencing outcome, studies reported the use of certain protocols and services to account for much of the variance in functional outcome. Since the International classification of functioning, disability and health framework acknowledges the context specifics of an individual and the execution of functional tasks within a context, it is imperative to have insight into the factors predictive of functional outcome of individuals between different settings and geographical areas in order to formulate the rehabilitation process for a particular group of individuals [8]. Classified among the most disabling chronic diseases, stroke affects not only the individual but also his/her family and society at large unlike other disabling conditions the onset of stroke is sudden leaving the individual and family ill prepared to deal with the sequelae [2]. The long term consequences of stroke have been recognized and is of vital consideration worldwide. Various epidemiological studies of stroke have focused on mortality and risk factors profile but not on quality of life issues. Quality of life related to stroke and life satisfaction after stroke is important health care issue that have not received sufficient attention in Indian sub-continent [9]. Stroke causes sufficient decrease in quality of life even among those who have no post stroke disability. In various populations across globe multiple risk factors including age, gender, dependency in activities of daily living, disability, social support, depression, institutionalization and diabetes have been associated with poorer health related quality of life in stroke survivors [10]. In particular, various contributing factors which adds on furthermore to the list of problems includes deficit in motor control, abnormal synergistic organization of movements, impaired force regulation, muscle weakness, sensory deficit, and loss of range of motion also reduces the quality of life in patients with stroke [11]. Apart from promoting physical recovery and assisting in activities of daily living, a major challenge in stroke rehabilitation is to minimize psychosocial morbidity and to promote the reintegration of stroke survivors into their family and community. The identification of key factors influencing long term outcome are essential in developing more effective rehabilitation measures for reducing stroke related morbidity. The World Health Organization (WHO) framework of functioning, disability and health highlights and focuses the importance of people with a health condition functioning in society. This often necessitates social integration, return to work potential and work performance. The measurement of participation gives a more objective view of recovery that is important in Estimating recovery. Psychosocial factors of concern in the longer term as outcome of participation after stroke include depression, self-esteem, and social support satisfaction which are among the various socio demographic variables that influence participation. An emphasis on these as well as recovery of functional ability provides a more complete picture of the experiences of patients following stroke. Thus a theoretical model of predictors of participation restriction which included the direct and indirect effects between psychosocial outcomes, physical outcomes, and socio demographic variables after stroke would be required [12]. As the population ages, more persons are having stroke and more are surviving the acute phase. Consequently, the number of stroke patients returning to the community is growing. This will result in an increase in the number of persons who will

seek community based services to prevent deterioration and also to increase their functional capacities to facilitate their community reintegration, and to promote health related quality of life. Projecting the type and number of services that will be required will depend on the health and on the impairments, disabilities, and handicaps of people with stroke and hence it becomes important to determine level of activity limitation and participation restriction as predicting outcomes [13]. Handedness is a prominent feature of human motor control that has been well described phenomenological through the identification of tasks that are preferentially performed with one or the other arm [14]. However, the neural mechanisms responsible for this behavioural asymmetry are not well understood. The most prevalent theory of motor lateralization suggests that preplanning and feedback mediated mechanisms are differentially controlled by each hemisphere. According to open/closed loop hypothesis, preferential sensorimotor access of each arm to the contralateral hemisphere and thus to one or the other process, is thought to result in manual asymmetries. The term, close loop, refers to mechanisms that are mediated by sensory feedback, whereas open loop refers to mechanisms that for any given movement are not affected by feedback. However, open loop mechanisms may be influenced through the feed forward use of sensory information obtained during previous movements [15]. On the other hand postural disorders seen in individuals with strokes are related to asymmetric weight bearing. However, the precise function of both hemispheres in controlling static standing posture or weight bearing which is a prerequisite to ambulation remains unclear [11]. In humans each cerebral hemisphere of brain is responsible for initiating motor activity and receiving sensory information from the opposite side of the body. However, each cerebral hemisphere has a large degree of specialization. Despite this specialization, normal thinking and carrying out of activities requires the integrated function of both hemispheres, neither of which is truly dominant over the other [16]. The right hemisphere mediates learned behaviours that require voluntary initiation, planning and spatial perceptual judgement whereas the left hemisphere is specialised for learning and language affection of which can cause different types of apraxias. Both of hemispheres are important for purposeful movement [1]. These purposeful movements are required in functional activities of daily living and fulfilling life roles to the best level of work potential and work performance for participation in life situations. Keeping this in mind the purpose of the study is to find out whether cerebral hemispheric difference reflects measure of activity limitation and participation restriction as outcome.

2. Aims and Objectives

The current study aims to compare Activity Limitation and Participation Restriction of individuals with Right and Left Cerebral Hemisphere Stroke.

Objectives

- To measure of Activity Limitation and Participation Restriction of individuals with Left Cerebral Hemisphere affected.
- To measure of Activity Limitation and Participation Restriction of individuals with Right Cerebral Hemisphere affected.

- To statistically compare the results of the above two measures.

Hypothesis

Null Hypothesis

There will be no significant degree of difference between Activity Limitation and Participation Restriction of Individuals with Right and Left Hemisphere Stroke.

Alternative Hypothesis

There will be significant degree of difference between Activity Limitation and Participation Restriction of Individuals with Right and Left Hemisphere Stroke.

Operational Definitions

Stroke: World Health Organisation defines stroke as a rapidly developing clinical signs of focal or global disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin [17].

Activity Limitation: it is the difficulty that an individual faces in executing activities (grooming, toileting, mobility, feeding and dressing) [3].

Participation Restriction: are the problems that on faces in involvement of life situations (domestic life, learning and applying knowledge, general tasks and demands, communication, mobility, self-care, interpersonal interactions, major life areas, community social and civic life) [3]

3. Methodology

3.1 Study Design

This is a cross sectional study

3.2 Sampling Technique

Samples are selected by convenient sampling

3.3 Source of Data

Community dwelling stroke subjects were taken form in and around Ludhiana.

3.4 Eligibility

3.4.1 Inclusion Criteria

- Subjects with Cerebral stroke
- Mini- Mental State Examination 16 or above
- 40 to 60 years of age
- 6 months to one year old Stroke
- Brunnstrom stage of motor recovery 2 to 5
- Modified Ashworth Scale 1 to 3
- Appropriate rehabilitation taken

3.4.2 Exclusion Criteria

- Recurrent Stroke
- Multiple area affected Stroke
- Other co morbid states restricting activity (diabetes , cardiovascular disorders etc)
- Other neurological conditions other than Stroke

3.5 Procedure

Based on inclusion and exclusion criteria 50 community dwelling subjects with right cerebral hemisphere stroke and 50 community dwelling subjects with left cerebral hemisphere stroke were approached and assessed. Informed consent was taken from all the subjects. These subjects were divided into two groups of right cerebral hemisphere stroke assigned as group A and left cerebral hemisphere stroke assigned as group B. Level of activity limitation was measured with Barthel index of activities of daily living for both the groups. The sum of the scores was calculated based on actual functioning and not potential functioning, corresponding to the person's level of ability to perform in all the ten items of the Barthel index. The performance for preceding 24 to 48 hours was considered. The scores were obtained from person's self-report, from a separate party who is familiar with the patients abilities (such as relative or care taker) or from observation. All the guidelines for filling the Barthel index were followed appropriately. Participation restriction was measured with London handicap scale for both the groups. The subjects from both the groups were instructed as to how to fill the questionnaire prior to administration of scale and scores were obtained by asking the subjects in both the groups to fill the self-completion questionnaire appropriately. The values obtained from the questionnaire were calculated later on. A prior appointment and covering later were sent to the subjects of both the groups to for reducing dropout rate. There after data was collected, compiled and analyzed.

3.6 Description of Measurement Tools

Barthel Index of Activities of Daily Living: It is a researcher rated 10 item scale which records actual functional level of individual. The information can be obtained from patients self-report or from a separate party who is familiar with patient's abilities. It has high test retest reliability and construct validity [18].

London Handicap Scale: It is a self-completion questionnaire that determines the effect of chronic disorders in domains of mobility, physical independence, occupation, social integration, orientation and economic self-sufficiency. It has a high test retest reliability and construct validity [19].

4. RESULT

Data was meaningfully assorted through calculation of Mean and Standard Deviation (SD). Later on Unpaired 't' test was applied for comparison of values obtained from London handicap scale and Mann Whitney- U test was applied for comparison of values obtained from Barthel Index of activities of daily living.

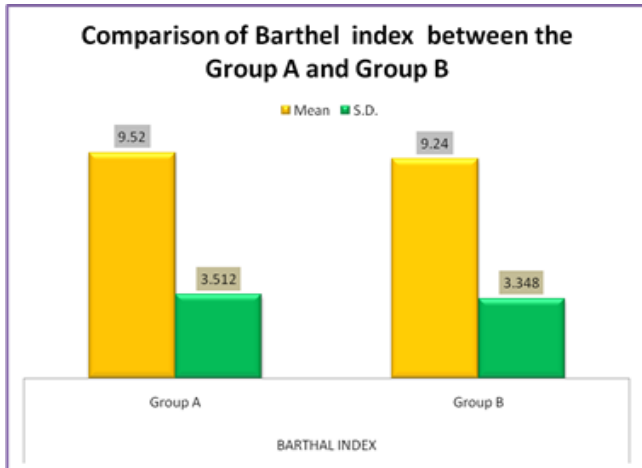
Table 1: Shows comparision of Barthel Index between the Group A and Group B

Mann Whitney- U test	Barthel index	
	Group A	Group B
Mean	9.52	9.24
Standard deviation	3.51	3.35
Mann Whitney- U test	1202.50	
$t_{0.05}$	965.00	
Results	Non-significant	

$P < 0.05$ Non significant

$p > 0.05$ Significant

Table 1 shows Mann Whitney- U test result of comparison of values obtained from Barthel Index between Group A and Group B. The Mean \pm Standard deviation value for Group A was 9.52 ± 3.51 and Group B was 9.24 ± 3.35 . The Mann Whitney- U test value for comparison of Barthel Index scores between the groups was 1202.50. Which was statistically non-significant, at $p < 0.05$.



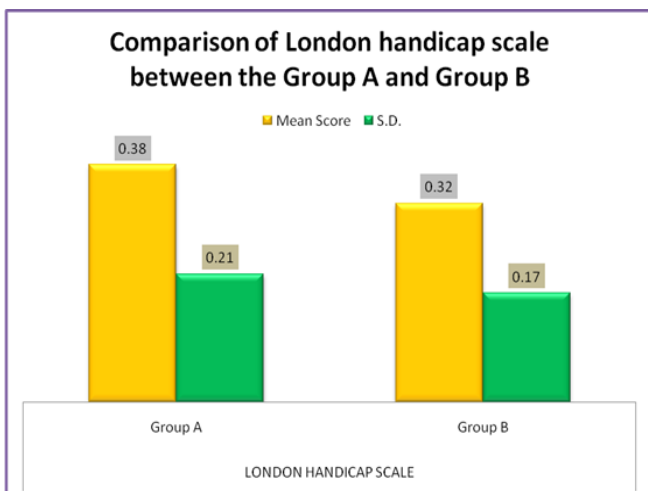
Graph 1

Table 2: Shows comparison of London handicap scale between the Group A and Group B

Unpaired 't' test	London handicap scale	
	Group A	Group B
Mean	0.38	0.32
Standard deviation	0.205	0.175
Unpaired 't' test value	1.626	
$t_{0.05}$	2.01	
Results	Non-significant	

$p > 0.05$ Non significant
 $p < 0.05$ Significant

Table 2 shows unpaired t test result of comparison of values obtained from London handicap scale between Group A and Group B. The Mean \pm Standard deviation value for Group A was 0.38 ± 0.205 and Group B was 0.32 ± 0.175 . The Unpaired t test value for comparison of London handicap scale scores between the groups was 1.626 which was statistically non-significant, at $p > 0.05$.



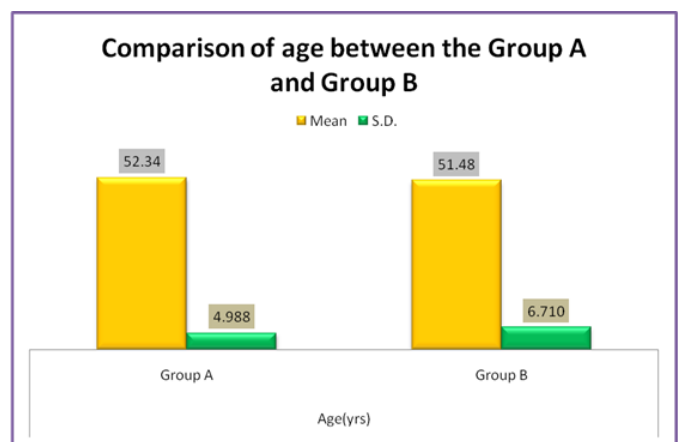
Graph 2

Table 3: Shows comparison of age between the Group A and Group B

Unpaired 't' test	Age	
	Group A	Group B
Mean	52.34	51.48
Standard deviation	4.988	6.710
Unpaired 't' test value	0.72	
$t_{0.05}$	2.01	
Results	Non-significant	

$P > 0.05$ Non significant
 $P < 0.05$ Significant

Table 3 shows unpaired t test result of comparison of age between Group A and Group B. The Mean \pm Standard deviation value for Group A was 52.34 ± 4.988 and Group B was 51.48 ± 6.710 . The Unpaired t test value for comparison of age between the groups was 0.72 which was statistically non-significant, at $p > 0.05$.



Graph 3

5. DISCUSSION

The current study aimed at comparing activity limitation participation restriction based on cerebral hemispheric difference. The hypothesis that there is significant difference in activity limitation and participation restriction in individuals with right and left hemisphere stroke was rejected. The mean \pm standard deviation value for Barthel index of group A was 9.52 ± 3.51 and Group B was 9.24 ± 3.35 and on comparison using Mann Whitney- U test value was 1202.50. Which was statistically non-significant, at $p < 0.05$. On the other hand the mean \pm standard deviation value for London handicap scale of group A was 0.38 ± 0.205 and group B was 0.32 ± 0.175 and on comparison using Unpaired 't' test the value was 1.626. Which was statistically non-significant, at $p > 0.05$. The result of the study document that there is not a significant difference in level of activity limitation and participation restriction of individuals based on side of cerebral hemisphere in post stroke individuals. This result has several important ramifications, as the level of activity limitation and participation restriction of an individual is multifactorial in its determination. The lack of difference among the two groups could be attributed to various psychosocial, physical and socio demographic variables that contribute to activity limitation and participation restriction independently. This result likely reflects the fact that both hemispheres contribute to unilateral limb movements, an interpretation supported by neural activation studies in humans [20]. These unilateral limb

movements are essential for performance of activities of daily living and full filling life roles. The complex reorganisation and formation of new functional connections within remaining brain tissue after stroke that results in functional and structural changes leading to adaptive changes in brain tissue is described by the phenomenon of neuroplasticity [21]. These adaptive and functional changes in remaining brain tissue after stroke are responsible for the level of activity limitation and participation restriction a person has post stroke. The result of the current study could likely suggest that the adaptive changes in the remaining brain tissue in post stroke individuals are also independent of side of cerebral hemisphere. The degree of specialisation among the cerebral hemispheres, that is, the left hemisphere is supposed to be dominant for motor control and the right hemisphere dominant for spatial orientation could individually affect both activity limitation and participation restriction of a person. In the study by Voos and Ribeiro de valle [22]. Which was aimed to test the hypothesis that left-side lesions cause greater impairment of voluntary movement, while right-side lesions cause loss of spatial attention and postural control had confirmed with this degree of specialisation among the cerebral hemispheres. These findings could provide an explanation for lack of difference in scores of activity limitation and participation restriction in both left and right cerebral hemisphere groups. The lack of difference could also be attributed to the various domains used in London handicap scale namely the social integration which focuses on the ability of getting on with people, as the people post stroke mostly shows depressive symptoms and social stigma attached to the disease which is consistent with study conducted by Chau et al. [12]. Other domains of the scale economic self-sufficiency which targets persons affording capabilities and occupation which includes persons work and leisure activities could also be affected by person's emotional and social wellbeing, hampering with the scores of both the groups. As Participation is the accomplishment and engagement of a person in activities of daily living and social roles, resulting from the interaction between personal factors and environmental factors acting as facilitators or obstacles. An obstacle in the environment can hinder the accomplishment of activities or roles and thus lead to a reduction in participation when it interacts with personal factors [23]. The socio demographic a contextual factors (living arrangements) has an effect on participation [12]. As the sample drawn was from community dwelling individuals from Indian household they would be facing a relevant amount of contextual barriers including all sorts of physical, psychological and social constraints hindering with the participation of people with stroke. Given these theoretical arguments, the baseline study not only sets out to determine the activity limitations, and participation restriction based on hemispheric difference in post stroke individuals but also suggests a rationale framework for investigating the factors influencing functional outcome of patients with a stroke.

6. CONCLUSION

The study concludes that there is no significant difference in level of activity limitation and participation restriction of individuals with stroke with respect to side of cerebral hemisphere as the null hypothesis was accepted and alternate hypothesis was rejected.

6.1 Limitations

It's difficult to maintain complete homogeneity among the groups as lot of confounding variables could affect the study. All the contextual factors influencing activity limitation and participation restrictions could not be measured

6.2 Future scope of study

Dominance or handedness could also be considered while doing such comparison. Specific strokes based on areas of distribution of arteries could also be used for comparison of activity limitation and participation restriction of individuals post stroke. More elaborative multicenterd or longitudinal studies could enforce the finding of the study.

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Author Profile

Amandeep Singh received Bachelors of Physiotherapy from M.S. Ramaiah Medical College, Bangalore affiliated to Rajjiv Gandhi University of Health Sciences, Karnataka and did his Masters of Physiotherapy in Neurology from All Saints Institute of Medical Sciences and Research, Ludhiana (Punjab), affiliated to Baba Farid University of Health Sciences, Faridkot, Punjab. Currently working as Assistant Professor in All Saints Institute of Medical Sciences and Research, Ludhiana, Punjab.

