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EFFECT OF ARM TRAINING IN STANDING ON POSTURAL CONTROL AND BALANCE IN PATIENTS WITH CHRONIC STROKE.

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ABSTRACT

Introduction: The majority of interventions post stroke typically target isolated impairments or functional limitations. Training the arm and postural control in isolation, may not restore integrated functional use necessary for independent skilled performance of activities of daily living. Explicit cues only for the arm during training in standing with no cueing for postural control to facilitate an implicit learning process for the Postural Control and Balance.

Purpose: Arm training in standing improves postural control and balance in Individual with chronic Stroke.

Methods – 32 participants (mean age 64 ± 7) received training involving hand grasp, reach and release in standing 1 hour, 3days/week for 6 weeks. Training focused on task completion with no explicit instructions provided for postural alignment, weight shift or balance strategy. Testing consisted of PASS, Berg Balance Scale (BBS) and Activities-specific Balance Confidence Scale (ABC).

Result- Mean Difference in score of PASS 3.59, in BBS score by 4.25 and in ABC 2.81 suggest that it is significantly improved after intervention.

Conclusions- Postural control improved following task oriented arm training in standing without explicit postural control goals, instruction or feedback challenging current training paradigms of isolated postural control training with conscious attention directed to center of pressure location and movement.

KEYWORDS : Postural control; Balance; Stroke; Upper extremity training; Standing.

INTRODUCTION:

The World Health Organization (WHO) defines stroke as 'rapidly developing clinical signs of focal disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin'.**[KNGF Guidelines 2004]**

When considering physical disability post stroke, less Than 20% of stroke survivors regain functional use of the their paretic arm , almost 50% Lack independence in activities of daily living and while 82% regain standing and Ambulatory abilities , postural instability persists which can lead to falls, injury and further disability.[1][2][3]

The majority of interventions post stroke typically target isolated impairments or functional limitations. For example, arm training approaches are conducted in the seated position. Likewise, postural training studies, while conducted in standing, rarely include concurrent functional arm training in reaching or manipulator tasks. [4][5][6]

Training the arm and postural control in isolation, may not restore integrated functional use necessary for independent skilled performance of activities of daily living. For example, activities such as food preparation, bathing and dressing, require integrated postural control, ambulatory skills, reaching, grasping and manipulation of objects in the standing position.[13] When combining reaching for an object in standing, components that contribute to performance of the task include anticipatory postural responses to stabilize posture, weight shift to move the body center of mass (COM) towards the object, visual fixation on the object, as well as the voluntary grasp, reach and release of the object.[14][15]

Explicit cues only for the arm during training in standing with no cueing for postural control to facilitate an implicit learning process for the Postural Control and Balance. Visual and vestibular inputs are likely to be more relevant sources of information when proprioceptive information is unreliable, for instance, during sway. Postural stability can be understood as the ability to keep the center of gravity (CG) within the limits of the BS, or stability limits; these limits are not fixed, but rather can be modified according to tasks, movements, individual biomechanics, and environmental aspects [17]. Thus, impairments in range of movement, tone, strength, and muscle control can influence postural control. Anticipatory postural control and voluntary arm movement are thought to be controlled by different, but parallel descending pathways these parallel control mechanisms need to be integrated for effective activity completion without loss of postural control or a fall.[16][17]

The purpose of this study is to provide a proof of concept that combining explicit cues for goal oriented arm training, while standing will result in implicit training of postural control. Such findings would suggest that clinical practice may benefit from this combined explicit/implicit learning approach for more efficient training of both arm function and postural control in a biologically integrated manner.

The clinical measures of postural control and balance included the PASS (Postural Assessment Scale for Stroke Patients) Berg Balance Scale (BBS) and the Activities specific Balance Confidence Scale (ABC). All tests have been validated for use in the stroke population and have been used to characterize balance deficits.

PASS is a postural assessment scale specifically designed to assess and monitor postural control after stroke. It contains 12 four-level items of varying difficulty for assessing ability to maintain or change a given lying, sitting, or standing posture.

The Berg Balance Scale (BBS) was designed to help determine change in functional standing balance over time. BBS as a means through which change in patient status can be determined in two situations. The first situation occurs when the BBS is administered before and after some intervention is applied and the change score is considered when the clinician attempts to establish if the intervention is effective for that individual. The second situation occurs when the BBS is used to describe an individual's standing balance in transfer.

Activity specific balance scale Self-report (subjective) measure of a patient's level of confidence in performing various activities without losing balance or becoming unsteady (balance self-efficacy).

MATERIALAND METHODS

DESIGN AND PARTICIPANTS:

- Study Area: Parul Sevashram Hospital, Physiotherapy OPD.
- Study Design: Interventional Study.
- Sampling Technique: Quota (Selective) sampling
- Sample Size: 32 patients

INCLUSION CRITERIA:

- Chronic unilateral ischemic or hemorrhagic stroke
- Age 50–80
- 6 months post stroke
- Ability to stand unsupported for 5 min with contact guard of the trainer

DATA COLLECTION AND MEASURES:

- This study recruited 32 participants with chronic hemi paretic stroke. All the patients fulfilling inclusion criteria were recruited for the study. All the three outcome measures were taken pre-intervention and post-intervention.
- Outcome Measure: PASS, BBS, ABC
- Procedure: Subjects received training 1 h, 3×'s/week, for 6 weeks consisting of 5 upper extremity (UE) tasks with 30 repetitions,

involving grasp, reach and release Activities. Training tasks, performed in standing, included:

(1) Grasp, forward reach and release ball in target buckets.
(2) Grasp, reach forward through hoop and release ball in bucket targets.
(3) Grasp with pronated forearm and supinated to place hoop ball on horizontal pole.
(4) Grasp with palmer grasp, flex and abduct arm to place hoop ball on horizontal pole.
(5) Grasp peg ball with supinated wrist, reach forward and place peg in elevated peg board.

STATISTICAL METHOD:

- The pre-intervention and post-intervention mean values of all the three outcome measures PASS, BBS & ABC; were statistically analyzed using paired t-test using **R software 2.15.2**.

RESULTS:

- Mean age of 32 patients was 64 ± 7 years.
- Mean value and p-value of all the three outcomes using paired t-test.

TABLE 1: **Showing MEAN ± SD of PASS, BBS and ABC**.

OUTCOME MEASURE	MEAN ±SD	
	PRE-INTERVENTION	POST-INTERVENTION
PASS	30.37±1.71	33.96±0.73
BBS	46.34±4.17	50.59±3.23
ABC	79.50±5.38	82.31±4.97

FIGURE 1: Comparison of pre-intervention and post-intervention PASS

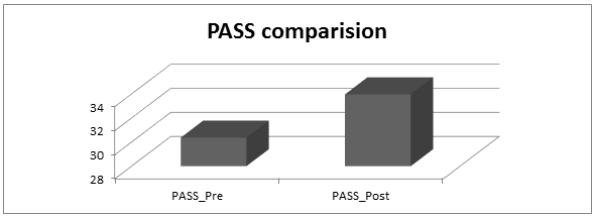


FIGURE 2: Comparison of pre-intervention and post-intervention BBS

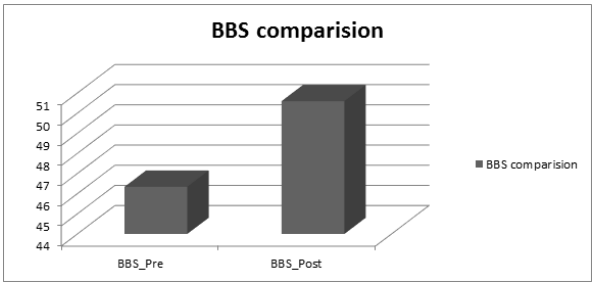
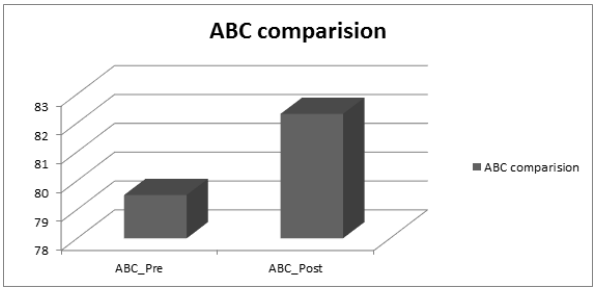


FIGURE 3: Comparison of pre-intervention and post-intervention ABC



DISCUSSION:

Our primary finding was that postural control improvements were seen following a hemiparetic arm training intervention performed in standing without explicit postural control instruction, suggesting implicit postural learning had occurred. Arm training in standing with no explicit cues for balance control can train two tasks at once and is potentially more efficient and effective use of therapist and patient treatment time. The explicit focus and instruction on arm training also serves as an external attention focus.

Recently a number of researchers have examined the impact of an external attention focus on postural sway in standing in healthy adults [24, 25].Since postural preparation and control are not typically under conscious voluntary control, challenging postural responses as part of functional tasks (in this case arm training in standing) may engage sub cortical neural pathways that are thought McCombe Waller and Pretty man Gait Posture to be active and involved in postural movement preparation, planning and execution and normally work in coordination with cortical pathways that control goal directed arm movement.

It has been suggested that training with an attention focus on postural control may, in fact, be disruptive to the unconscious control processes that sub serve these automatic postural actions [26].Therefore, the significant postural control improvements resulting from training the upper extremity in the standing position, suggest an alternate intervention option for training postural preparation, planning and execution in the post stroke population in contrast to more traditional balance interventions that focus on isolated stability and weight shift training with explicit feedback. A number of studies in chronic stroke with a conscious focus on postural control have demonstrated improvements in walking speed, endurance and in clinical measures of balance [10, 11].

CONCLUSION:

Clinical measures of postural control and Balance improved following task oriented arm training in standing without explicit postural control goals, instruction or feedback. This finding challenges current training paradigms of isolated postural control training that have conscious attention directed to center of pressure location and that promote movement in the absence of integrated arm function.

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