Research Article

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Effectiveness of Gait Training Using Body-Weight-Supported Treadmill among Patients with Stroke: A Review Study

Abdullah Ibn Abul Fazal[1*], Md Waliul Islam[2], Nahid Tahlima[1], Zulkar Naine[1] and Md Golam Kibria[1]

[1]*Clinical Physiotherapist, Department of Physiotherapy, Centre for the Rehabilitation of the Paralysed (CRP), Dhaka, Bangladesh.*

[2]*Senior Clinical Physiotherapist, Department of Physiotherapy, Centre for the Rehabilitation of the Paralysed (CRP), Dhaka, Bangladesh.*

[*]Correspondence:
Abdullah Ibn Abul Fazal, Clinical Physiotherapist, Department of Physiotherapy, Centre for the Rehabilitation of the Paralysed (CRP), Dhaka, Bangladesh.

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ABSTRACT

Background*: Body-weight-supported treadmill training (BWSTT) or herness system is a new approach to treat gait recovery among stroke patients.*

Objectives*: To explore the effects of gait training using body weight supported treadmill or herness system among stroke patients.*

Methodology: *This study aimed to explore the effectiveness of gait training using body-weight-supported treadmill among stroke patients by reviewing of the article. Five articles were reviewed in order to fulfil the purpose of this study. With a PEDro score ranging from 4 to 8, randomized controlled trial was used. Each article is analyzed carefully to find out the effectiveness of the intervention.*

Results: *In this study found that both BWSTT and conventional overground training has beneficiary effects for recovery and had impact on parameters related to balance, mobility, and fear of falling among stroke patients.*

Conclusion: *To determine the intensity and precise number of training sessions that should be carried out to restore normal gait, more and better study is required.*

Keywords
Stroke, Physiotherapy, Harness.

List of Abbreviations
BWSTT: Body-weight-supported treadmill training, UC: Usual care, WHO: World health organization, BWS: Body weight support, ADL: Activities of daily living, CT: Conventional training, OGT: Overground training, TUG: Timed Up and Go, TGT: Treadmill gait training.

Introduction
Walking difficulty is the prime challenge for the patients after stroke. 50% people who have suffered from stroke and remain alive in acute phase cannot walk independently and they need proper rehabilitation to attain purposeful level of ambulation [1]. Some human and animal study found out that strategy adopted to retrain walking in patients with neurologic injury can significantly influence the degree of locomotor recovery [2]. A recently created gait-training methodology for neurologic patients' employments a saddle framework that bolsters a rate of a patient's body weight, subsequently emptying the lower limits whereas the persistent is being prepared to walk on a treadmill [3]. There is some study that recommend that gait reeducation with bodyweight support (BWS) has beneficiary effect rather than overground gait training in regard to endurance and agility or speed, lower extremity motor recovery and balance. Studies suggest that retraining gait leads to a more successful recovery of ambulation with respect to overground walking speed and endurance, functional balance, and lower-

limb motor recovery. It too diminishes the sum of physical help required to walk [4].

Approximately 50% of stroke patients are somewhat subordinate for exercises of everyday living (ADLs) and less than 50% of survivors are able to walk within the community [5,6]. Numerous stroke patients don't have a walk that permits them to perform all their day-by-day exercises. A few gait-training strategies have been appeared to be successful in progressing functional gait reeducation [7]. As of late there has been an unused kind of walk preparing that includes halfway or full bolster of body weight or emptying of lower appendage with the assistance of herness. It is the aim of this investigate venture to comparability the impacts of stride preparing with body weight support (BWS) and without BWS on utilitarian results in stroke patients, thus encouraging venturing on a treadmill [8].

Assistance of treadmill strolling there's a beat of venturing that makes a difference to create neuroplasticity as upper appendages are upheld by herness system. Gait preparing amid real strolling favors distant better; a much better improved a higher recuperation of strolling capacities than a more customary approach that emphasizes control of disconnected components of walk some time recently ambulation is continued [9]. BWS gives a symmetric weight bearing or emptying of both lower appendages tangle produce a setting that ought to detect the improvement of compensatory strategy in related to preparing with methodology helps which can lead to deviated weight bearing of stroke patients [10]. Preparatory considers recommend that the utilize of BWS leads to distant and improved a much better recuperation of ambulation, with impacts on overground strolling speed, perseverance, and physical help required to walk [11]. This study aims to find out the effectiveness of gait training in treadmill using body-weight-support (BWS) or herness among stroke patients.

Methodology

This narrative review was done following the methodology described by Gasparyan et al. [12]. Search strategy: A comprehensive search was conducted on PEDro, Pubmed and google scholar including Medical Subject Headings (MeSH) terms identified as “BWSTT”, “Conventional therapy”, “physiotherapy”, “Harness system”, “Overground gait”. Inclusion criteria were randomized controlled trial with a PEDro score of >4.

Narrative Review

Around 50% of stroke patients are partially reliant on for activities of daily living (ADLs) and less than 50% of survivors are able to walk in the community [13]. Persistent with hemiplegia does not have legitimate strolling capacity or typical walk so that they can do all their family work by themselves [14]. There are a few procedures created by analyst that have appeared their adequacy by progressing the walk design and useful capacities among understanding with stroke. Both task-oriented technique preparing and stride preparing on treadmill are altogether successful instead of ordinary procedure (neurodevelopmental treatment and extending) in making strides stride speed and gait-related exercises, illustrated by the Coordinated Up and Go (TUG) test, [15]. In stroke patients. Such kind of preparing includes gear and supervision by an advisor. Increasingly self-rehabilitation programs are being created, since it has been built up that restoration within the persistent stage of stroke can be compelling [16]. Therapy at domestic is additionally prescribed for stroke patients to anticipate disintegration in ADLs [17]. Such programs are imperative, since stroke patients don't keep up useful picks up after the cessation of recovery [18]. Overground strolling could be a basic strategy of stride preparing accessible to all patients. Be that as it may, a later Cochrane survey found that there was deficiently prove to decide whether overground strolling altogether makes strides stride movement [19].

Sixty to 80% of people with stroke who recapture strolling autonomy after restoration, walk at speeds less than 0.8 m/s, driving to limitations in community versatility and decreased social interest [20]. Deciding mediations that make strides strolling work is crucial to upgrading long-term wellbeing and well-being for people within the unremitting organize of stroke (≥ six months after stroke). Body weight-supported treadmill preparing progresses strolling work in people with persistent stroke in any case, it has not appeared to be beneficial over routine treatments [21,22]. One such ordinary treatment, overground strolling preparing, is the foremost commonly utilized in restoration after stroke, but has restricted prove of adequacy conflicting conventions, and has not been straightforwardly compared with body weight-supported treadmill preparing [19]. Overground strolling preparing has been compared with treadmill preparing without body weight bolster for people with unremitting stroke [23]. Critical changes in speed, continuance, and strolling design in favor of treadmill preparing were detailed, demonstrating that it may give a more noteworthy sum and concentrated of venturing hone than ordinary overground strolling preparing.

Body weight supported treadmill training (BWSTT) may be a task-oriented strategy for stride rebuilding after stroke [24]. BWSTT has the advantage over ordinary treatment because it offers higher concentrated, more monotonous and task-oriented hone over the same period of time when compared to customary treatment [25]. A few ponders have appeared that BWSTT was more successful in stride speed advancement than normal physiotherapy [26]. It has been illustrated that BWSTT actuates changes in corticomotor sensitivity which led to made strides adjust and walk execution with persistent stroke [27]. In any case, other ponders have detailed that BWSTT was not predominant to ordinary walk preparing [28]. Recent thinks about have detailed that BWSTT can increment strolling continuance within the subacute arrange after stroke, but no advancement was detailed in adjust and 10m walk test [29].

There are some other similar studies which have nearly similar effect such as a study conducted by Park et al., (2013) [30] by an RCT where 40 participants of stroke included. They were randomly divided into two groups, the OGT group and the TGT group, and further categorized according to their individual walking speeds. Both of the groups performed training ten times

for about 7 days. After that they found out OTG subjects showing significant result rather than TGT group in terms of walking speed and gait endurance. So they concluded that OTG is more effective than TGT.

Another study of MacKay-Lyons et al., [29] where he compared the effects of BWSTT to UC in improving the cardiac wellness and early walking capacity after stroke. In that study 50 participants were included. Participants were randomly assigned to 1 of 2 interventions: BWSTT + UC or UC. All individuals participated in 60-minute physiotherapy sessions 5 times weekly as inpatients for 6 weeks and 3 times weekly as outpatients for another 6 weeks. Later he concluded that BWSTT elicits greater improvements in cardiovascular fitness and walking endurance than UC in the subacute poststroke period.

A study of Bonnyaud et al., [31] where they compare the immediate effect of a single overground training session versus a single treadmill training session on TUG performance in hemiparetic patients. 56 hemiparetic patients were randomized to 1 or 2 distinct groups: a single gait training session overground (O group) or on a treadmill (T group). Later they concluded that an overground training session and a treadmill training session were equally effective in improving TUG performance in hemiparetic patients. Hemiparetic patients should be encouraged to walk regularly overground including turns for 20 minutes without stopping.

Discussion

After a review of these articles, it helped to gain a clear conception and knowledge about the effectiveness of Body-weight-supported treadmill training (BWSTT). Studies demonstrated that in post-stroke patients, CT, BWSTT, and CombTG improved balance and mobility and decreased fear of falling. Additionally, the CombTG outperformed the CTG and BWSTTG in terms of balance and mobility. Although CT and BWSTT had different frequencies, both had positive effects on the end measures.

Another study by Dundar et al., [32] after 30 sessions came to the conclusion that there was no discernible change in balancing function between the CTG (five times per week) and the BWSTTG (three times CT plus two times BWSTT per week). In the current study, we discovered that CombTG (five times CT per week + twice BWSTT per week over 30 sessions) significantly outperformed CTG in terms of improvement in balance.

Conclusion & Recommendations

This review study reveals that BWSTT has significant impacts on parameters related to balance, mobility, and fear of falling, while isolated BWSTT administered less frequently is just as beneficial as CT administered more frequently in ambulatory post-stroke patients.

Our findings can help determine how well BWSTT training programs that are combined or isolated work. The patient's

Author and Year	Participants	Intervention	Outcome tools	Results	PEDro score
Mao et al. (2015) [33]	24	Patients received gait training with BWSTT for an average of 30minutes/day, 5 days/week, for 3 weeks.	Brunel balance assessment. Fugl-Meyer assessment scale. gait capture system.	Both groups have improvement on lower limb motor function and improved balance measures ($P < 0.05$), kinematic were also improved on BWSST group ($P < 0.05$).	05
Dean et al. (2010) [34]	126	The experimental group undertook up to 30 minutes of treadmill walking with body weight support via an overhead harness for 6 months.	10-m walk test, 6-m walk test, Adelaide Activities Profile.	No significant difference found in both independent walking groups in terms of speed experimental group walked 57m then the control group. Participation and number of falls were the same for both control and experimental group, perception of walking was better than the control group.	08
Combs-Miller et al., (2014) [35]	20	Body weight-supported treadmill for about 30 minutes of walking intervention for 2 weeks.	10-meter walk test, 6-minute walk test, spatiotemporal symmetry, ICF scale, Borg Rating of Perceived Exertion Scale, Fugl-Meyer Assessment.	Participants of overground training group showed good improvements in walking speed in comparable to body weight-supported treadmill training group the overground walking training group significantly improved comfortable walking speed aspects of gait symmetry.	06
Barbeau & Visintin, (2003) [36]	100	The subjects were trained to use a BWS system with an overhead harness to support up to 40% of their body weight while walking on a treadmill (BWS group) for 6 weeks.	Pfeiffer Short Portable Mental Status Questionnaire, Berg Balance Scale, STREAM, 10 m walk test.	All clinical outcomes were significantly better for the BWS group. The individuals' initial overground walking speed, endurance, balance, and motor recovery were stratified, and the more severely damaged subjects showed a statistically significant difference in gait and balance dysfunction across all outcomes.	04
Mustafaoğlu et al. (2018) [37]	45	Patient received 45 minutes of BWSTT twice a week, conventional therapy lasts for 45 minutes five days a week. Only conventional therapy was given to the CTG five days a week. Only twice a week did BWSTT reach the BWSTTG.	Berg Balance Scale, (e-SLST/n-SLST), Timed Up and Go Test (TUG), Falls Efficacy Scale-International, Rivermead Mobility Index, 10-m Walk Test, Stair Climbing Test.	With the exception of the CWT group, the mean change in outcome measures showed that improvements between groups were significantly different.	07

motivation to participate in post-stroke rehabilitation on a more frequent basis and the availability of a physiotherapist should all be taken into consideration when choosing the best course of treatment for balance improvement. To assess the long-term effects of BWSTT on balance and mobility function in stroke patients, additional thorough investigations are needed for exactly how much training session should correct abnormal gait among stroke patients.

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