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Review Article

Role of Increased Exercise Therapy Time in Stroke Rehabilitation

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Abstract

Introduction: *Stroke, is an important and well known cause of disability and physical impairment among adults all-over the world. The most commonly accepted treatment to rehabilitate patients with stroke is physiotherapy. The present review is an attempt to explain the impact of increased exercise therapy time (physical or occupational), compared to the normal duration of therapies in patients with stroke.*

Methods: *We systematically searched electronic databases including Medline, Scopus, PubMed, CINAHL, and Cochrane to review published literaturein this area. Electronic searches have shown limited studies, which investigates the effects or no effects of increased duration of physiotherapy in patients following an attack of stroke. Articles, which reported on healthy participants i.e. people without stroke, were excluded. Also excluded were primary prevention studies, economic evaluations, and simple case reports.*

Results: *A total of 175articles were identified using the keywords in the above mentioned databases. However, following the designedinclusion and exclusion criteria for this review only 11articles were included in this review.*

Conclusion: *The result of this review supports the substantiate effectiveness of increased duration of exercise therapy among patients with stroke, as it has a favourable effect on activities of daily living. However, further research is needed in this area due to limited availability of high quality published evidence.*

Keywords: *Stroke, Cerebrovascular disorder, activities of daily living, increased exercise time.*

Introduction

Stroke, is an important and well known cause of disability and impairment among adults all-over the world.[1] In the United Kingdom, stroke is said to have more impact on disability than any other chronic condition.[2] More than half of all stroke survivors are left dependent on others for everyday activities.[3]In real numbers, this accounts to 5 million people. Moreover, according to the WHO study[4]cerebro-vascular diseases have been identified as one of the main cause of the lost DALYs (disability-adjusted life years) worldwide.

Stroke-induced brain damage cannot be reversed; hence, the rehabilitation is considered to be the cornerstone of stroke management, with physiotherapy being the most recognised and generally accepted treatment.[5]Usually, the effect of stroke is quite profound, affecting an individual's capacity to carry out their routine work and mobility. Thus, the foremost aim of physiotherapy is to maximise one's potential to recover their capacity to move about and continue to carry-on with their activities of daily living (ADL).[2]

ADLs are typically interpreted as the usual things that people do in everyday life but ADLs also have different connotations for patients with stroke.[6] However, in rehabilitation sciences, ADLs have special connotation and are considered a measure of everyday activity following a stroke attack.[7]

Following rehabilitation, there is significant improvement in stroke patients. Viosea et al. posit that the explanation for the improvements seen in functional status following physiotherapy has to be something other than mere spontaneous recovery.[8]The most widely utilised method to enhance the quality of life among people who have had a stroke is rehabilitation.[9] The foremost purpose of physical rehabilitation is to enable the, individualto get back home and enters into the larger society life as far as possible.

The outcome of improvement after stroke as well as the time it takes to recover has been investigated by several researchers.[10-12] However, they have either not investigated the complete range of pertinent disabilities or the entire period of recovery from the impairment. One thing common to them is that all of them recommended increased duration of exercise therapy after stroke.

Nowadays, especially in light of increased understanding about recovery from stroke, it is mostly believed that increased duration and intensity of physical therapy enhances

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the outcome of disability secondary to stroke.[11-14]However, Dromericket al.[15] concluded that increased dose of constraint-induced movement therapy may worsen the functional outcomes.It is also essential to point-out that the duration of physiotherapy that is typically provided to stroke patients is quite little. The common practice in the UK and most countries in Europe, are a paltry 20 to 30 minutes of physical therapy per day.[16]

A number of trials have been carried out by physical and occupational therapists on longer rehabilitation sessions for stroke patients. These trials have resulted in variable findings, from no demonstrable benefits to substantial effects of improvement following longer or more intense exercise sessions. In the presence of such substantial variability, a systematic review of all these studies will provide a rational synthesis of the research base and allowing a clearer picture to emerge. The present review is an attempt to explain the impact of increased exercise therapy time, compared to the normal duration of therapies such as physical or occupational therapy for people with stroke.

Methods

Search Strategy

We systematically reviewed the published literature to identify studies regarding effectiveness of increased exercise therapy time among stroke patients. Electronic searches of databasesincluding Medline, Scopus, PubMed, CINAHL, PEDRo and Cochrane were searched for the literature published from January 1990 to Dec 2012.Boolean operators were used for searching of relevant articles. Keywords including Stroke ORCerebrovascular disorder AND increased exercise therapyOR increase physiotherapy AND exercises OR physiotherapy were used for literature review.

Study Selection

Initially, abstracts of all 175 articles were reviewed by two independent reviewers and were categorised into either 'relevant', 'irrelevant' or 'unsure' groups. Full text articles were reviewed of all articles grouped into 'unsure' category to deciding upon their relevancy for this review. The third reviewer was contacted in case where the two independent reviewers were not able to form consensus on inclusion or exclusion of an article or articles for this review.

Inclusion Criteria

The inclusion criterion in this review was limited to only those clinical trials published in English language during January 1990 and December 2012.Only studies, which investigated the effect or no effect of increased duration of physical therapy in patients following an attack of stroke, were included. The participants in the included studies needed to have undergone an evaluation of the effect of additional therapy time following stroke.In addition,only those clinical trials were included in this review in which patients followed minimum of time exercise frequency per week.

Exclusion Criteria

Clinical trials were excluded which reported on healthy participants i.e. people without stroke were excluded. Also excluded were primary prevention studies, economic evaluations, and simple case reports.

Quality Assessment

The Critical Appraisal Skills Programme (CASP) checklistfor randomized controlled trial[17]was used to assess the internal validity and overall quality of the included studies.

Results

A total of 175 articles were searched from above mentioned databases using the keywords. Out of these articles,156 were excluded after reviewing the abstracts. Eventually, over 20 articles were considered for full text analysis and appraisal. To make-out studies that involved similar ideas to ones listed in the inclusion criteria, ample consideration and thought was given to the full text articles. Eventually, 10 articles that satisfied all inclusion criteria were used (Figure 1).

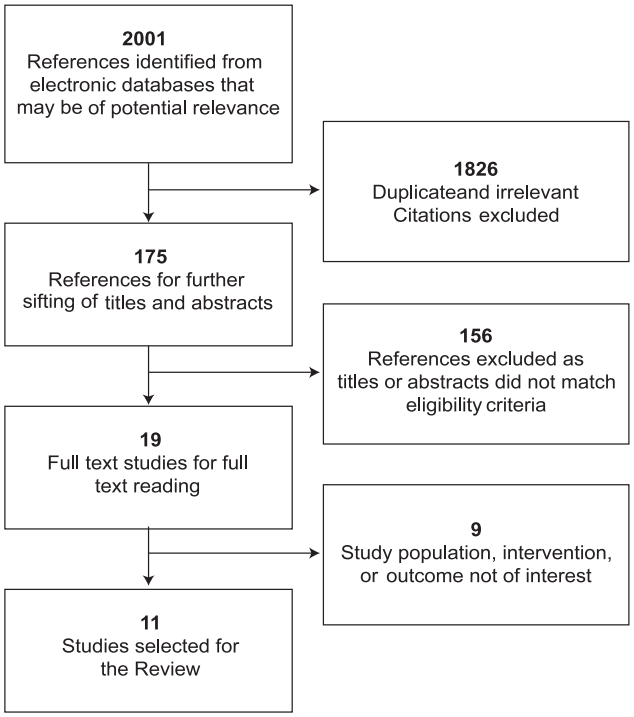

Fig.-1: *Flow diagram of study selection*

The studies in present review are selected irrespective of locationand hence studies from different countries can be seen in this review (i.e.China 1, Germany 1, India 1, USA 1, and UK7). Sample size of the included studies in this review ranges from 40to 233. Table 1 shows the summary of included studies.

Study	Intervention	Sample Size	Duration	Results
Fang et al. 2003	One group (n = 78) received AEP 45 minutes, five days a week for four weeks; the routine therapy group (n = 78) received no professional rehabilitation therapy	n-156	4 weeks	Community physiotherapy treatment 1 year after stroke leads to significant, but clinically small, improvements in mobility and gait speed that are not sustained after treatment ends.
Green et al. 2002	Community physiotherapy treatment versus control group	n-170	9 months	
Gilbertson et al. 2000	Six weeks domiciliary occupational therapy or routine follow up.	n-138	6 weeks	Patients in the intervention group were more likely to report satisfaction with a range of aspects of services.
GAPs 2004	The augmented therapy group received more direct contact with a physiotherapist (62 versus 35 minutes per weekday) than normal therapy controls.	n-70	6 months	There was no significant difference in any other outcome.
Logans 1997	53 patients were randomised to the enhanced service whereas the other 58 patients were assigned to normal care.	n-111	6 months	Trial supports the use of domiciliary occupational therapy for stroke patients after discharge from hospital in terms of improvements in functional outcomes in the short term, but the long-term benefits remain unclear.
Parker et al. 2001	Leisure therapy versus control group	n-233	12 months	There was no significant difference in any other outcome
Parteridge et al. 2000	Current standard amount of 30 minutes' physiotherapy with those receiving double that amount (60 minutes).	n-114	6 weeks	Doubling the physiotherapy time available for patients in a stroke unit will not provide a measurable benefit for all patients.
Platz et al. 2005	Three groups: (A) no augmented exercise therapy time, (B) augmented exercise therapy time as Bobath therapy and (C) augmented exercise therapy time as Arm BASIS training.	n-40	4 weeks	The AET time as Arm BASIS training enhanced selective motor control. Type of training was more relevant for recovery of motor control than therapeutic time spent.
Singh and Pradhan 2013	Modified constraint induced movement therapy (n = 20) or in a control group with conventional rehabilitation (n = 20).	n-40	4 weeks	Significant improvement in upper extremity function so it indicates that m-CIMT is effective in improving the motor function of the affected arm in stroke subjects. However, its long-term effect has not proved
Walkers 1999	Occupational therapy at home or to no intervention (control group) 1 month after their stroke.	n-185	6 months	Occupational therapy significantly reduced disability and handicap in patients with stroke who were not admitted to hospital.
Werner and Kessler 1996	One hour each of physical and occupational therapy, four times per week, for 12 wks. versus control group	n-40	9 months	Significant functional gains can still be attained in the post-acute stroke survivor, despite prior inpatient rehabilitation services.

Discussion

The purpose of this review was to assess the proposition that additional duration of physiotherapy would result in enhanced recovery of function among stroke patients. The premise is that the increased duration of physiotherapy would lead to amelioration in walking, agility and general activates of daily living in the group of people provided the additional exercise compared to the group who receive normal treatment.

Therefore, this research focuses on the result of additional physiotherapy duration for patients who have suffered a stroke. As stated in previously, the current practice is to provide approximately half an hour of physical therapy for a couple of days per week. Nevertheless, investigators such as Sonodaet al.[18] and Davidson et al.[19] did report inconsistent benefit when physical therapy was provided for a longer duration than is the current practice.

Additional duration of exercise than normally provided would improve recovery of functions among stroke patients was the hypothesis of this research and the technique was utilised to query existing research findings about the effects of increased physiotherapy time on ADL in patients who had suffered a stroke.

This result demonstrates that increased therapy time after a stroke attack leads to betterment in activities of daily living. A number of studies, which assessed the relationship between additional treatment time and enhancement of activities of daily living as well as agility[11, 20-25], agree with finding of this meta-analysis.

Robbins et al[26] posit that the factors of recovery from a stroke include the human brain's faculty for reorganization and adjustment and that regular therapies are not very conducive at restoring standard pace for many patients after a stroke. An over whelming support form literary circles indicated that sensory stimulation and feedback might have a beneficial effect on selective motor control after a stroke attack. The interventions were carried on for approximately 3 to 4 weeks (15 to 20 sessions); this amount of time might however be short of to observe meaningful benefits. However, Kollenet al[27]suggested a minimum session of at least 25 to 30 hours every week of augmentation was required to determine the exact dose required for the practice to take functional place.

In the biological circle of science, a well-known thing is careful practice for the resolution of getting and preserving expert performance that should be followed by a dose-response relationship. The condition manifests itself in activities such as sports, learn to play musical instruments, playing chess and typing on keyboards.[28-30] In essence, the more time one devotes to learning a certain motor skill the better the performance. The potential role of music in neurological rehabilitation was assessed by Sarkamoet al.[31] Study results showed that recovery in the domains of verbal memory and focused attention improved significantly more in the music group than in the language and control groups

According to Ericsson et al. studies examining a dose-response association in obtaining skills have provided insight about the most significant factor that differentiates the superiority of certain domain-related actions as carried out by experts (or professionals) while at the same time those achieved by less talented people is actually the duration of time that is dedicated to practicing the craft to acquire the particular skill.[28]

Recognizing the role of rehabilitation can be mostly observed as a development in which the patients are educated to achieve compound motor tasks such as dressing, walking and washing. It is pertinent to infer that rigorous training by hemiplegic patients with stroke must keep on the same biological rules. People with moderate/severe stroke, continuity in rehabilitation (preferably physiotherapy) during the first year after stroke seems to be associated with self-reported met needs for rehabilitation.[32]

Of the main points in studies in rehabilitation medicine that investigate dose-response relationships is determining to outline 'dose' or the amount of the practice. This is so that the dose of the requirements might be measured. According to Wang et al. there is solid indication that primary, amplified, concentrated and activity-oriented exercise can help advance motor recovery and actions on a day to day basis after a stroke.[33] Auxiliary arguments determine the task-oriented exercise method mostly focuses on repetition of recognizable practical tasks instead of movement patterns or any fundamental impairment. Mental connection, practical reasoning, and the advanced intricacy of tasks being taught are essential keys to motor training.

Biomechanics does not particularly agree with 'intensity', which might refer to the quantity of exterior work and/or command, which is measured. The studies that control the mechanical output of physical activity, for instance cycle aerometry or muscle-firming workouts is where the quantity of energy consumed to carry out the necessary task identified.[34]

The reiterations devoted to performing any specific skill is described as 'Frequency'. On the other hand, 'duration' denotes the minutes per time-period (e.g., per day or week) expended studying a particular task or on rehabilitation in general. Hence, we can conclude that frequency and duration are both the derivatives of the original quantity of exercise.

In ideal circumstances, it would be easy to measure the energy expended for each task but in reality, it is much more difficult. The reasons include lack of specialized equipment and the lack of specific knowledge of the amounts of energy required to perform certain tasks. Thus, we are left with rough approximations for rehabilitation medicine. These include the repetitions (frequency), time spent on physical exercise in unit time or the regularity of treatment sessions.

It is not yet feasible in the realms of rehabilitation medicine to determine the actual energy consumption during any specific physical exercise. The reason is that there are no indicators towards the disbursement with physical exercise (i.e., volume of exercise). The Cochrane review by Saunders et al. identifies limited rehabilitation medication studies, which fulfil the 1998 standards.[35] This therefore leaves us with the assumption that there is not enough information to guide clinical practice.

Having established the fact that it is prematurely difficult to estimate the exact quantity of energy being consumed during a certain exercise or physical motion we must wander over to some less than optimal estimates regarding the consumption of energy. These might include the number of recurrence to achieve a specific task or the time dedicated to exercise training.[36]

There are eleven randomized and controlled trials included in the report. These involve patients with acute or sub-acute, post-acute and chronic stages after stroke. Certain trials were limited to detailed sorts of patients such as with first-ever ischemic stroke. Other applied less constricting principles with respect to type, localization, and number of previous strokes.

The amount of functional exercise needed still remains an elusive yet controversial aspect of rehabilitation. Substantial disparities were found among trials with the total quantity of extra physical therapy. Some trials focused on gait exercise, some on dexterity while others limited their efforts to enabling ADLs in general.Kwakkelet al.[13]concluded that increased training intensities are more probable to speed up practical recovery after stroke. This is opposed to producing additional activities in the rehabilitation regime. GAPS study[37]suggests that it is likely that escalating the concentration of rehabilitation with those precise patients may not have had any effect on the results. However, there might be failure to establish a true result through a false negative (type II) error.

Conclusion

The available evidence from the clinical trial included in this review suggests that increased duration of exercise following an attack of stroke leads to enhancements in ADL.However, further research is needed in this area due to limited availability of high quality published evidence. It is only logical to assume that there is essentially a relationship between additional duration of exercise and the return of function following stroke. Though it was beyond the scope of this research to delve into the aspect of timing the exact moments to commence physical therapy, it did manage to highlight the necessity of beginning the exercise program following the onset of stroke, if the patient is medically capable for exercise.

Conflict of interest: None.

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