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Things to Note in Stroke Rehabilitation

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Abstract

Stroke results in impairment of motor, cognitive and sensory/perceptual functions. As such, activities of daily living (ADL) after stroke can be affected. These affectations can persist for a long time depending on the extent of the affectation in the brain and rehabilitation. In fact, stroke has lately been recognized as a long term condition. Thus, stroke rehabilitation requires intensive time. When stroke occurred, the brain capitalizes heavily on learning to recover function; and the best way to induce such learning is known to be through task specific training.

Effective stroke rehabilitation requires knowledge of the current available evidence base. However, to embrace the current available evidence, skills in information retrieval and critical appraisal of the literature are needed. Unfortunately, the skills of a say, entry level physiotherapists may not be adequate for them to be abreast of the evidence-based practice. Thus, there is a need to summarize the literature for such therapists to help them note some important issues in stroke rehabilitation.

Keywords: Stroke; Neuroplasticity; Self-management; Patience and perseverance and repetition

Introduction

Stroke is a global burden and a significant cause of long term disability. The disability following stroke usually affects performance of activities of daily living (ADL) both basic such as bathing, feeding and transferring; and instrumental such as shopping and managing finances [1]. Consequently, this may cause reduced quality of life [2]. Thus, one of the important goals of rehabilitation is to improve ADL [3,4] and hence quality of life [4]. One of the disciplines directly involved in the rehabilitation of people with stroke is Physiotherapy. However, it has been noted that there is stroke rehabilitation time constraint in most rehabilitation facilities [5], and the therapists may not be fully aware of the evidence based practice [6]. This may probably be due to inadequate educational facilities, professional development and the knowledge of extracting relevant information on the recent advancements in rehabilitation. Therefore, the aim of this article is to provide the therapists with the basic things to note in stroke rehabilitation. The article focused on the importance of understanding the plastic nature of the central nervous system (CNS), task specificity, task repetition, self-management, and patience and perseverance. See figure 1 for the stroke rehabilitation schema (Figure 1).

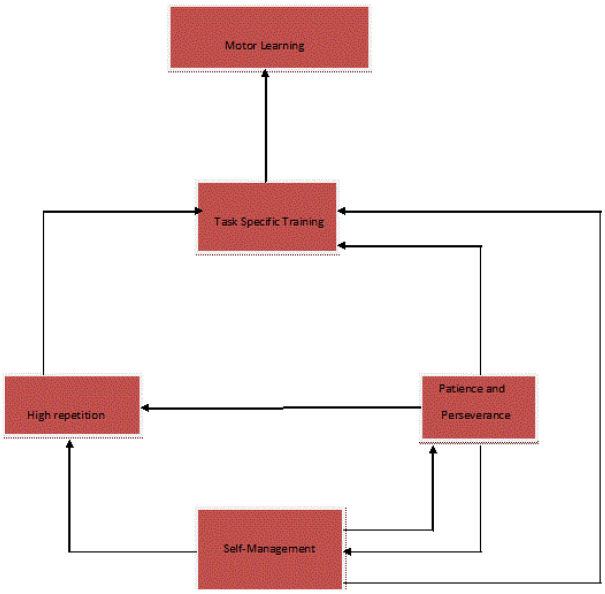

Figure 1: A Schema for Stroke Rehabilitation

The CNS is plastic

The CNS continuously changes its anatomical and neuro-chemical structures and functions following injury; and this can be shaped by our experience [7-10]. This experience is enhanced when animals are subjected to motor learning conditions. Kleim in 1996 randomized 75, 3 months old female rats into 3 groups (acrobatic condition, motor control condition and inactive condition) [8]. They found a better increase in number of synapses and percentage of Fos-positive cells in

the cortex of the rats in the acrobatic condition. Similarly, studies in adult stroke have demonstrated neurophysical neuroanatomic changes following motor skills learning [11-13]. The changes include decreased transcallosal inhibition of the ipsilateral cortex and increase in size of the cortical map controlled by the affected side. Liepert in 1998 subjected chronic stroke patients to 22 weeks constraint induced movement therapy (CIMT) [13]; and studied the excitability and representation of the motor cortex using Transmagnetic stimulation (TMS) and Motor Evoked Potentials (MEP) amplitude and location of the center of gravity (CoG) of the motor cortex. They found increased size of the motor output area and MEP amplitude, and considerable shifting of the motor cortex CoG.

What is very interesting is that, at whatever time since the stroke, the brain exhibits this plastic property, though the earlier the better [14]. Additionally, in the chronic stage, the brain appears to depend on surviving neurons and networks who may take new motor activity roles. The mechanisms through which plasticity occurs were reported to be strengthening synaptic response and growth [15,16].

Specificity of the Experience

Motor learning literature emphasizes the importance of the task or experience that will induce motor learning to be specific. The current available evidence suggests that, task specific training or experience is the best for neuroplasticity when compared with other rehabilitation therapies [17,18]. Task specific trainings are those kind skill acquisition trainings that are similar to everyday tasks or ADLs such as brushing, writing and arranging clothes in the cupboard [19]. They are approaches based on the assumption that normal movement is a bye-product of interactions between different systems, each contributing its own aspect of control. In addition, movement is organized around a behavioural goal and is constrained by the environment. They are the type of tasks that have redundant representation in the brain irrespective of presence of injury [20]. Thus, they can be retrieved both via both serial and parallel processing systems during skill acquisition or motor learning. For example, Nadeau in 2013, reported in a randomized controlled trial that, participants that underwent a locomotor training, a form of task specific training had 18% likelihood of transition to functional walking ability than those who underwent home exercise programs. What is very interesting in this study is that, participants were controlled for training dose, intensity and goal oriented focus. Thus, the relevance of task specificity to motor learning cannot be overemphasized.

Repetition of the experience

High repetition of task is important for motor learning [9]. However, what constitutes the intensity of repetition is debatable. Some studies used hours spent repeating the task; whereas others used number of repetition of the task. In any case, for motor learning, tasks have to be repeated. In the studies [14,21] that used hours spent repeating the task, ≥ 3 hours of task practice is considered as high repetition. In contrast, in the studies [22-25] that used number of repetition as a measure of intensity, 300-800 repetition is considered as high repetition. In the psychology literature, there is what is called habit formation or learning [26]. That is to say when a specific behaviour is repeated, its reference is formed in the brain [27]. Additionally, both cognitive and motor skills are executed more readily, rapidly, and accurately when they are practiced more [26]. This is known as automacity. Interestingly, both automacity and habit learning are intricately controlled by the striatum [28,29]. Furthermore, even in the earliest literature on plasticity [30], plasticity phenomenon was likened to a piece of metal which could be bent or modeled into a different shape when there is sufficient repetition and force. Consequently, repetition is an important aspect of stroke rehabilitation.

Self-management

Stroke rehabilitation consumes a considerable time, and considering the number of the therapists and that of the patients, this can be very challenging. Additionally, therapists disproportionately allot times in favour of a particular part of the body, say the lower limb [5]. Thus, in order to provide adequate time for the rehabilitation of individual with long term condition, a concept known as self-management was developed. Self- management is a health condition management strategy employed to empower patients to take charge of their health conditions [31,32]. It provides the patients with the necessary skills on self-efficacy to improve their health conditions [31,33].

Self-efficacy is a knowledge, skill or information gained from a particular task performance. There are various sources for gaining self-efficacy. These sources include mastery experience, vicarious experience, verbal persuasion and physiological feedback [34]. Mastery experience implies experience of success in improvement that potentiates self-efficacy. It is believed to be better gained when task are broken into very simple components. Example of this in the stroke literature can be seen in distributed practice during constraint induced movement therapy (CIMT) [22,35,36]. In these cases, tasks were performed in sessions per day, making the task performance much easier for the patients.

Vicarious experience entails being encouraged by observing a second person or others performing a task. This may help the observer (the patient) to be encouraged to perform similar task. In the stroke literature, group therapy [37] has helped patients to perform task better. Similarly, motor imagery has been taught through the observation of a second person [38,39]. Thus, if a patient will be taught and encouraged to observe a family or an informal caregiver performing a task and perform same thereafter, this can motivate a patient to participate effectively in his rehabilitation.

Verbal persuasion includes verbal validation and approval of the patient's effort by a significant other usually the therapist, spouse or a close family member or a friend. Recently, this has been provided in a form of motivational interviewing [40,41]. Motivational interviewing (MI) involves a talk-based therapy aimed at providing behavior change. This concept has been applied to improve mood changes and mortality outcomes following stroke [40]. Since patients may develop learned non-use [42] after stroke, MI may be used to encourage patients to use the affected limb. Similarly, MI may be used to encourage patients to fully engage with their rehabilitation.

Physiological feedback is when a feedback is provided by an improvement in physiological function such as improvement in the use of the upper limb or walking following rehabilitation in a stroke patient. According to Bandura in 1977, people are more likely to be motivated when they see or anticipate success. Thus, helping patients to recognize improvement in their conditions, is of paramount importance in stroke rehabilitation.

Patience and Perseverance

The traditional literature does not emphasize the role of patience and perseverance in patience care. Patience is an attitude which when nurtured could ensure compliance with rehabilitation or therapy. Patience and perseverance are important for every treatment [43]. Failure in task performance could be very frustrating, and may result in anxiety and depression [44]. However, if therapists and the family caregivers understand the importance of making the patients to embrace patience and perseverance, this may serve as a source of encouragement to the patients. According to the National Stroke Association in 2014, stroke survivors and their families can find workable solutions to their most difficult situations by approaching every problem with patience, ingenuity, perseverance and creativity. Therefore, observing patience and perseverance with rehabilitation is a key component of stroke rehabilitation.

Conclusion

Effective stroke rehabilitation may be achieved through a combination of good understanding of the plastic nature of the CNS, the use of task specific trainings, high repetition of the task, self-management and observance of patience and perseverance.

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