

Activity-based therapy in infants with spinal cord injury, the impact on standing, quality of life and health

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ABSTRACT

Spinal cord-related injury treatment has been massively revamped recently by the principles of neuroplasticity, a fundamental principle of ABT which includes five practices such as: weight-bearing activities, FES, task-specific practice, massed practice, and locomotive training.

This study explores the state of activity-based therapy for different classes of people ranging from adults to infants and its impact on standing, quality of life and health. Herein, activity-based therapies will be explored alongside how they affect the condition of infant spinal cord injury later in life and also where clinicians and researchers should focus to improve protocols at this age.

Keywords: activity- based therapy, spinal cord injury, infants, standing, quality of life

Introduction

In the recent years, there has been an increase in the incidence of spinal cord injuries, the most common causes of which being assault, car accidents, and falls. The resilience of healthcare technology and advances in medical treatment has also increased in tandem with this trend (Behrman et al., 2017)[2]. Ultimately, there has been an increase in life expectancy and quality of life among people living with spinal cord injuries, compared to previous years' outcomes. Indeed, the 21st-century discoveries have paved the way for enhanced healthcare practices, leading

to more positive outcomes (Marsh et al., 2011)[10]. Even though contemporary healthcare has seen some ground-shattering breakthroughs, this has not been without some shortcomings. There are secondary risks following SCI including respiratory diseases, which have been reported among the prevalent causes for re-admission of people who have previously suffered from spinal cord injuries. However, such complications can be effectively treated, thus allowing people to lead everyday lives.

Studies have shown diverse results among people who have undergone ABT following spinal cord

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injuries. Behrman et al. provided evidence of the possibilities of substantial recovery upon application of rehabilitative neural stimulation. More studies have elicited promising findings of ABT as it has assisted more patients to stand independently and make voluntary trunk and leg movements. According to Dolbow et al., (2015) [5] Activity-based Restorative Therapy (ABRT) was developed for responding to a diverse range of spinal cord injuries. However, the authors state that the process hinges primarily on SCI rehabilitation. Essentially, ABRT works through stimulation of the areas of proximity to the injury site. It is majorly geared towards addressing issues related to spinal cord paralysis. Other conducted studies relate to perinatal and intrauterine spinal cord injuries (Felter et al., 2019)[6]. Although intrauterine cases are rare, they demonstrate lower chances of survival. ABT in this cases serves a leading role in reducing secondary complications such as ulcers, pain bladder dysfunctions among others. However, SCI at the tender and developmental age can pose problems to the musculoskeletal development, especially without early intervention which may include ABT.

ABT includes stretching and strengthening exercises as well as mental activities (Dolbow et al., 2015) [5]. A better capacity to do day-to-day tasks, less dependence, and an enhanced life quality are some of the goals of the activity-based therapy (ABT) program designed to aid people with SCI.

A German study showed that ABT was associated with significant increases in patients' self-reported functional abilities, quality of life and psychological well-being (Felter et al., 2019) [6]. Several studies have found that ABT improves mobility and stability by strengthening the trunk and improving coordination. In terms of standing, quality of life and health outcomes, ABT's effects can vary widely from one person to another. The benefits of ABT can be influenced in various ways by a variety of factors, including age, gender, the severity of the SCI, and level of activity (Musselman et al., 2018; Behrman et al., 2017)[12][2]. Age-related physical restrictions may prevent older people from experiencing the same benefits from ABT that are achieved in younger patients (Felter et al., 2019)[6]. Accordingly, people who have had more serious spinal cord injuries can need more intense ABT

to improve their postural, health status and quality of life. Individuals with SCI have used a wide variety of treatments, such as electro-stimulation and robotic therapy, to improve their health outcomes and their quality of life, in addition to Activity Based Therapy (ABT). The use of these treatments may assist in the improvement of motor control, coordination, and strength. However, it is essential to remember that these treatments are unsuitable replacements for ABT and that, for the best possible outcomes, ABT should be utilized in conjunction with these other therapies.

The International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) can be applied to evaluate a person's standing ability, quality of life and health outcomes (Kirshblum et al., 2014; Jones et al., 2012)[9][8]. This registration form provides a complete description of an individual's mobility and functioning level in addition to evaluating the severity of an individual's damage to the spinal cord (SCI). This knowledge can be used to identify appropriate therapies, such as ABT, to ameliorate the negative effects of bad posture, health and quality of life.

To carry out this literature review, a literature search was conducted in the following scientific databases: Google Scholar, Science Direct, Microsoft Academic, PubMed and CINAHL. The key-words (mesh terms) used in the search engines were: "Activity-based Therapy", "spinal cord injury", "ABT in infants", "ABT in children" and "neuroplasticity" in various combinations, with the use of the disjunctive terms AND and OR. The inclusion criteria for the published scientific papers included time of publications, peer review consideration and relevance of the content to the topic. This research utilized a compilation of the available studies related to the study topic. The study began by exploring the article related to activity-based therapy in general, then zeroed in on one more specific detail about the topic by adjusting the keywords, such as the inclusion of infants and children to the stated search words, to identify the most relevant studies (Chen & Xiao, 2016) [4]. Moreover, time factors were applied in filtering the studies by selecting the acceptable threshold age of the target articles. The articles which have been published within the last ten years were the most preferred and were selected on the ground they contain updated data and current statistics and figures

related to the study topic (Arici et al., 2019) [1]. In parallel, this study applied peer-reviewed articles and the ones found in credible online databases. Similarly, at least 15 articles were used in the study to provide a broad basis for comparing facts and findings from different sources hence minimizing the chances of errors and bias. Ultimately, this study was conducted with close attention to the required ACTA standards.

Discussion

Activity-Based Therapy Impact on Children with Spinal Cord Injury

Children with spinal cord injuries benefit from physical therapy in the form of activity-based therapy to improve their health and quality of life. It's predicated on the idea that people can recover lost abilities by engaging in targeted exercises (Felter et al., 2019) [6]. Therapy that places an emphasis on movement may incorporate exercises such as standing, walking, swimming, or cycling.

More and more studies have been done in recent years on the outcomes of activity-based therapy for children with spinal cord injuries. These therapies have been shown to enhance postural quality of life and health outcomes for children with SCI (Kirshblum et al., 2014)[9]. Children with spinal cord injuries can improve their motor control, strength, and mobility with the help of intensive activity-based therapy. The findings of the studies prove this. Children with spinal cord injuries made significant progress in their ability to walk, run, and use their hands through activity-based rehabilitation.

The International Spinal Cord Injury Association establishes guidelines and provides a way to record the extent of spinal cord injuries (Kirshblum et al., 2014)[9]. It is used to assess the severity and prognosis of SCI. Several scientific investigations have demonstrated that the ISNCSCI is an accurate method for rating the severity of spinal cord injuries in young people. Several forms of physical therapy are employed to enhance the ability of standing, quality of life and health outcomes for children with spinal cord injuries, in addition to activity-based rehabilitation. All of these approaches involve some form of physical therapy with the goal of improving patient's range of motion, muscular strength, and coordination

(Kirshblum et al., 2014)[9]. A child's range of motion, balance, and coordination can all benefit from water therapy following SCI.

Standing, quality of life and health outcomes for children with spinal cord injuries can be significantly improved with the use of activity-based treatment. Used in conjunction with other physical therapy methods (including stretching, and balance training), it can help patients recover from injuries and regain mobility and strength (Harkeman et al., 2012; van Hedel & Dietz, 2010)[7][14]. The International Standards for Neurological Classification of Spinal Cord Injury has been proven useful in numerous research efforts for assessing serious SCIs. (Kirshblum et al., 2014)[9]. Children with SCI can benefit from activity-based therapy with or without orthostatics, in terms of both standing, quality of life and health outcomes.

The Effect of ABT on Babies With SCI

Infants (6-24month) with SCI can benefit considerably from activity-based therapy in terms of standing, quality of life and health outcomes. From 0 year old to 6 months, there are no protocols for ABT. at this tender age. At the age of 6 months, an uninjured infant can begin to stand upright with assistance. If the injury occurs during the first 6 months, the goal must be to maintain the extensibility of the soft tissues by the therapists and the parents, so that as the baby grows, it is not limited by secondary comorbidity issues. Meng et al. (2015)[11] found that robots-assisted variants of ABT can be deployed in assisting in the rehabilitation of the lower limbs.

The primary objective of movement therapy is to encourage as much physical movement as possible. The goal is to help patients regain their physical ability as much as the damage level allows. However, Meng et al. (2015)[11] observed that the point that most of the currently available interventions hinge on the therapists' experience and subjective judgement is a serious hindrance to the realization of strong SCI, as there is not an established intervention manual. Simple exercises, climbing stairs, getting up from a seated position, and extending arms and hands, can help mobility and strength.

Infants with SCI benefit from ABT, since it has been found to enhance life quality and health outcomes.

The patient's mobility, coordination, and stability can all benefit from activity-based therapy. Hence, their quality of life will improve since they will be able to take part in more of their regular activities by using strategies which conquer in the treatment program. Activity-based rehabilitation can help lessen the intensity of post-spinal-cord-injury complications like stiffness and muscle atrophy.

As a result of ABT, changes might be shown in ISNCSCI in incomplete. The ISNCSCI classifies patients into different categories based on their overall state of physical, mental, and cognitive health (Felter et al., 2019)[6]. The motor skills of patients who engage in activity-based therapy may improve, leading to a higher ISNCSCI classification. Those who are mindful of their posture may experience positive changes to their health and well-being.

Hence, more evidence are needed for benefits of infants with SCI from activity-based therapy to improve their standing ability, quality of life and health outcomes. Patients who take part in activity-based therapy have a higher ISNCSCI classification, report less pain, and have improved mobility, balance, and coordination Behrman et al. (2017) [2]. Hence, healthcare practitioners should consider the perceptible importance of ABT when treating newborns with SCI.

Neuroplasticity in Babies

The potential of neuroplasticity to aid those who have suffered neurological impairment has been the subject of increased research in recent years. Because of their greater neuroplasticity and recovery potential after severe neurological impairment, babies and children are of particular interest (Brazg et al., 2017) [3]. The potential of activity-based restorative therapy to aid recovery from spinal cord damage in newborns, children, and adults is the primary focus of the publications presented.

Articles discussing transdisciplinary, intense, activity-based treatment for intrauterine spinal cord infants are particularly intriguing. Examining the case of a 3-month-old baby who was successfully treated after suffering a spinal cord injury at birth, it is clear that electrical stimulation was used in conjunction with physical and occupational therapy to assist the

infant in regaining mobility (Quel et al., 2017)[13]. This case study's optimistic findings provide preliminary evidence that activity-based restorative therapy may be beneficial for newborns with SCI.

Restorative therapies involving physical exercise are viewed in terms of their potential to aid in rehabilitating people with SCI. These articles highlight the significance of applying international criteria for the neurological categorization of SCI for adolescents and children and the requirement for trustworthy data (Winstein et al., 2014)[16]. They also talk about how neurological damage affects how SCI kids move around when standing up. Evidence from this research suggests that activity-based restorative therapy may help patients with spinal cord injuries regain some movement.

Much work is needed, but activity-based restorative therapies have shown promise in helping children and adults recover from spinal cord injuries. The need for accurate evaluation methods for youngsters is a serious obstacle. Moreover, there is difficulty in coming up with solutions that are both harmless and productive for kids (Felter et al., 2019; Winstein & Kay, 2015)[6][15]. Finally, minimizing potential adverse outcomes is difficult while keeping therapies positive for newborns and young children.


Notwithstanding these obstacles, activity-based restorative therapies have shown promise in facilitating healing in newborns, children, and adults with spinal cord injuries. This review's articles shed light on the promise of activity-based therapies for facilitating recovery and the obstacles that must be overcome to realize that promise (Felter et al., 2019)[6]. SCI recovery in newborns, children, and adults may benefit from activity-based restorative therapies in the future if current research and development efforts are successful.

Conclusion

Compendiously, regardless of age, people with SCI can benefit significantly from activity-based rehabilitation in standing, quality of life and health outcomes. Activity-based therapy has been shown to benefit children and adults with SCI by enhancing their mobility, strength, and coordination hence can be a key driver in the unlocking of less pain and

improved life quality. In addition to helping patients achieve a higher classification on the ISNCSCI, activity-based therapy can lessen the likelihood of secondary disorders developing. In addition, infants with spinal cord injuries benefit from activity-based therapy. The current experimental developments in activity-based therapy and activity-based restorative therapy harbour the promise of more robust discoveries which can allow the restoration of standing and walking abilities among the affected people. From the available evidence sourced from recent studies, it has been unravelled that mobility, motor control and strength can be restored with the aid of intensive ABT interventions.

Despite the ground-breaking breakthroughs which have been revealed so far, most of them are majorly at the experimental stage; hence ABT is yet to be integrated into mainstream intervention approaches.

Further study and development are needed, but activity-based restorative therapies show promise for helping people of all ages recover from spinal cord injuries. The quality of life of people with SCI can be enhanced through activity-based therapy, which may also lead to more independence and mobility. However, in order to respond effectively to the SCI issues of every patient, there is a need for a customized approach that resonates with the unique nature of the individual challenges of the involved people. Likewise, it is recommended that proper and more overriding SCI measures be integrated with traditional mechanisms such as stretching and chiropractor-oriented intervention to increase the chances of more positive outcomes, even though this requires more scientific interventions. As a result, more research is beckoning to unlock the full potential of the ABT field. 

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