

Ouachita Baptist University

Scholarly Commons @ Ouachita

Honors Theses

Carl Goodson Honors Program

4-19-2022

Rock Climbing Therapy for Individuals with Disabilities

Grace Loftin

Follow this and additional works at: https://scholarlycommons.obu.edu/honors_theses



Part of the [Exercise Science Commons](#), and the [Kinesiotherapy Commons](#)

Rock Climbing Therapy for Individuals with Disabilities

Grace Loftin

Ouachita Baptist University

Abstract

Rock climbing is an actively growing sport and recreational activity which has high physiological and psychological demands. While requiring strength, endurance, balance, and cognitive skills to navigate routes, it is a form of physical activity that benefits one's body in many ways. This thesis overviews research which focuses on the benefits that may be gained and observed from climbing, through a therapeutic standpoint. Therapy can be described as the process of restoring or improving something, and even though rock climbing is a very physical activity, "physical therapy" is not a part of the title of this thesis as it will look at the profits this activity may provide to the individual as a whole. Much research has been accomplished on recreational therapy activities, such as rock climbing, but little is found on rock climbing and the use of it as a health-based intervention for the entirety of the body. Even less has been done on rock climbing as a beneficial activity for individuals with disabilities. This thesis will allow deeper investigation into the life of someone with a disability and how any improvements of the state of their body and, or, mind can considerably improve one's quality of life through exploration and research on rock climbing therapy for individuals with disabilities. Cerebral palsy, a disability consisting of many impairments, will also be reviewed so as to provide a more specific observation on how rock climbing is an activity that can be highly advantageous to these individuals once the right accommodations may be made.

Key Words: climbing, therapy, disabilities, cerebral palsy, accommodations, benefits

Word Count: 4,320

Introduction

Physical activity has been repeatedly proven to not only advance one's physical health, but their overall well-being and quality of life. Recreation-based physical activity allows someone to create a healthier lifestyle for him or herself through an enjoyable outlet that best suits their life, and there are numerous possibilities of what this may look like. Many of these possibilities can often be viewed as therapeutic experiences as well. However, for individuals with disabilities, the opportunities for any form of therapy and physical activity are not quite as extensive. Due to limitations varying from capabilities, accessible facilities, and the lack of available resources, multiple recreational forms of physical activity are not participated in by individuals with disabilities. This is often a result of a lack of inclusion, or the inability to be able to; therefore, creating few opportunities for research upon the therapeutic benefits such activities could produce for them. One example is that of rock climbing, and "until now only few research projects have investigated the feasibility of climbing as a potential activity for heightening physical activity in children with cerebral palsy and the possible beneficial effects of climbing activities in populations with functional and, or, cognitive challenges," (Schram-Christensen et al., 2017). Cerebral Palsy is an example of a disorder that may limit someone on the activities they can participate in, but because of how adaptive rock climbing can be and the constraints it applies upon the body, an individual with this disability can still benefit from partaking in it. Revolving around a growing community, rock climbing can be an experience that includes physical manipulation of one's body, require strategic thinking, and can involves various levels of team work to advance to other levels. Rock climbing as a form of a therapeutic intervention for individuals with a disability, such as cerebral palsy, can provide physical, cognitive, and sociological benefits for the individual.

Disabilities in Detail

Disabilities, and living with a disability may look tremendously different from person to person. An overarching definition for an individual with a disability, as defined by the Americans with Disabilities Act (ADA), is someone:

Who has a physical or mental impairment that substantially limits one or more major life activity. This includes people who have a record of such an impairment, even if they do not currently have a disability. It also includes individuals who do not have a disability but are regarded as having a disability, (Americans with Disabilities Act, 1990)

These impairments may be something that one was born with, obtained from an accident, or even developed over time. An individual with a disability may live a similar daily life, or a completely different daily life, compared to that of someone who does not have a disability as the impacts of different disabilities vary in so many ways, and some disabilities are physically invisible.

Viewing them as “invisible” addresses the fact that not all impairments are physical, and that it may not be immediately obvious whether someone is disabled or not. Any individual with a disability, despite the nature of their impairments, will face some sort of difference in their activities of daily living in comparison to someone without any impairments.

Due to differences, outlined by disabilities, from the surrounding society, individuals with disabilities are not always viewed equally or are often even discriminated against, intentionally and unintentionally. For this reason, the Americans with Disabilities Act was passed to prevent and prohibit any form of discrimination of an individual based upon his or her disability in areas such as employment, transportation, and public areas or services, (Americans with Disabilities Act, 1990). Examples of this include using person-first language, broadcasting detailed job descriptions when hiring, adding braille labeling on all signs, having doorways that are the appropriate width for wheelchairs, and overall ensuring a facility is fully accessible to

anyone and everyone, (Chelette & Reynolds, 2019). Along with following the proper guidelines for guaranteeing accessibility to any individual and eliminating any physical barriers, using person first language enforces viewing an individual with a disability as a person, and not their impairment, and promotes inclusion in the community. Activities of daily living includes physical tasks, social interactions, and emotional interactions as well. Therefore, how someone conducts him or herself while interacting with an individual who has a disability, can also determine how inclusive or exclusive they are and the type of society they are creating.

When addressing physical fitness and activity for individuals with disabilities, they are confronted with the same barriers of public attitude, physical access, and lack of resources or availability in society. The general lack of opportunities for adapted recreation may be diminished by an increase of resources and willing individuals; however, eliminating attitudinal barriers is not quite as feasible. For example, there are team sports and activities available that individuals with disabilities may participate in, but with the goals being to compete, and “with an over-emphasis on performance and wining, children (individuals) with disabilities may find few opportunities to be included”, (Bauman, 2022). This is due to public attitudes, and even the attitudes of parents or caregivers of these individuals resulting from concern of the barriers they may be faced with such as a coach not understanding their condition and never allows him or her leave the bench, or an activity guide not willing to work with them due to possible disruptions for other participants. These mindsets and attitudes take time to breakdown as they require internal changes to the heart and mind for them to be altered. The other barriers including physical access, accessibility throughout, and the lack of funds require external changes. Some resources such as transportation, or personal assistants, may be provided by insurances as they are often required for many individuals to ensure that all programs and services fully integrate

individuals with disabilities as best as possible according to the Americans with Disabilities Act; unfortunately, though, this is not always so, (Americans with Disabilities Act, 1990, Bauman, 2022). Individuals with disabilities require physical activity just as individuals without disabilities do, and these walls that prevent an inclusive community in society impact the realm of physical activity and these individual's opportunities for recreational activity as well.

Cerebral Palsy in Detail

When looking into the different types of disabilities and disorders, cerebral palsy is a disorder that leaves an individual with many different disabilities. Cerebral palsy can be defined as “a group of permanent disorders of the development of movement and posture, causing activity restrictions, that are attributed to non-progressive disturbances that occurred in the developing fetus or infant brain;” which can lead to the restricting of many daily life activities, (Castelli et al., 2016). Being a non-progressive disorder, this means that the actual damage to the brain will never worsen overtime; unfortunately, though, the other disabilities linked with cerebral palsy may. The clinical features of cerebral palsy vary from individual to individual, but generally include muscle spasms, ataxia, dyskinesia, and other comorbidities such as intellectual disabilities, movement disorders, and behavioral disorders, (Vitrikas, Dalton, Breish, 2020). These conditions qualify individuals with cerebral palsy as individuals with disabilities as they have the potential to disrupt one, or more of one's daily activities. The physical, emotional, and cognitive impacts cerebral palsy places upon an individual and his or her guardians, or caretakers, can drastically change how one lives their life.

Cerebral palsy is a condition in which the brain is affected and most often occurs during the perinatal period of a child's development typically due to factors varying from preterm birth, preterm use of antibiotics, acidosis, or essentially anything that may lead to a brain injury during

this time frame. Its causes are not always clear however, and cerebral palsy can be developed at an older age due to a sustained brain injury or infection, (Vitrikas, Dalton, Breish, 2020).

Diagnosis of cerebral palsy is based upon identification of its associated characteristics and impairments that tend to be permanent, as its etiology is sometimes uncertain. Diagnosis normally occurs around one to two years of age, when disabilities begin to come visible, but with perinatal ultrasonography and magnetic resonance imaging (MRI), this diagnosis can take place as early as six months of age, (Vitrikas, Dalton, Breish, 2020). The earlier a diagnosis, the sooner the classification of the cerebral palsy can be assessed and then a proper treatment plan may be set in place. Classification of one's cerebral palsy describes the severity of his or her condition and how intense their treatment plan, involving everything from medication to therapy, may be. One's classification is based upon motor abnormalities, coexisting impairments, imaging findings, and the etiology and timing of the case. These classifications will contain labels such as di-, hemi-, or tetraplegic to identify the severity of spastic paresis, ataxia, mixed types, and motor performance levels based upon assessment tools such as the Gross Motor Function Classification System, (Sadowska et al., 2020). There are many clinical assessment tools available to use and the Gross Motor Function Classification System is a widely used tool that observes one's functional motor abilities. Based upon age classification and performance levels of posture, mobility, and balance; levels vary from a Level I classification where the individual can move without assistance, to Level V where the individual is not able to move on their own at all, (Vitrikas, Dalton, Breish, 2020). To physicians, therapists, and care takers, these classifications provide vital information on how the individual with cerebral palsy must be treated and cared for, and to create a baseline of their current condition so any improvements or comprises can be monitored and treated accordingly.

When treating cerebral palsy, a holistic approach should be taken to address the physical, mental, and emotional needs of an individual by their loved ones, or caregivers. Rehabilitation is a multifaceted process which “through direct and indirect actions, it focuses on the individual in all his dimensions, physical, mental, emotional, communicative, relational, and it involves the family, social and environmental context,” (Castelli et al., 2016). Cerebral palsy is a condition that impacts life in every way, and an individual with cerebral palsy should be provided with a team of health workers and caregivers to address these needs. For the physical impairments and comorbidities created by cerebral palsy, treatments normally include pharmacotherapy, surgical interventions when necessary, and physical and occupational therapy. Rehabilitation and therapy for movements disorders should be tailored to the individual and enacted as soon as possible because the potential for neuroplasticity to occur, which is the ability of the nervous system to adapt to stimuli, is highest in the earlier developing stages of one’s central nervous system, (Sadowska et al., 2020). Ensuring a treatment plan has been enacted on time is key in aiding rehabilitation and ensuring that other symptoms such as poor motor coordination and spasticity do not worsen. When treating a chronic musculoskeletal condition, physical or occupational therapy may consist of multiple days of therapy each week using multiple modalities such as electrical nerve stimulation, manual mobilizations, myofascial release, and strengthening exercises with the goals of relieving pain, improving posture and coordination, and achieving functional improvement in activities of daily living, (Rand et al., 2007). Cerebral palsy is a complicated disorder that, itself, does not progress, but much rehabilitation is required to ensure its comorbidities do not progress either and to potentially improve the overall quality of an individual’s life. The various classifications of one’s cerebral palsy and the underlying conditions of it determine the main course of a treatment plan, but, “it must be remembered that

no classification can be dissociated from an individualized and multidimensional approach that takes into account the functional status of the person and his needs,” (Castelli et al., 2016).

Rock Climbing as a Form of Therapy

Indoor and outdoor rock climbing is a growing sport and recreational activity which is physically and mentally demanding of its participants, but it can be participated in any level of expertise or competitiveness for one’s enjoyment. Climbing, whether indoor, or outdoor, can be modified and has many different techniques and equipment that allow any individual to be able to climb at their own level so they may profit from the activity in every possible way. Belaying through the top rope technique and assisting the climber, using harnesses, choosing alternate routes, and utilizing interchangeable handholds on the walls create multiple possibilities of routes and different climbing levels, (Seaton, Spring 2022). Also, many other apparatuses such as adjustable bouldering walls that are ground level and other modifications such as the para pull-up and different climbing prosthetics permit climbing to be accessible to every individual despite most impairments one may have, with little to no risk, (NCHPAD, 2021). So even individuals with cerebral palsy may benefit physically, mentally, and even sociologically from climbing.

Climbing “involves strength, endurance, postural stability, technique, balance, coordination, route finding, and attention, as well as a number of psychological aspects beyond fear, which put high demands on the participant,” (Schram-Christensen, et al., 2017). Some of these requirements may exceed the capabilities of someone with cerebral palsy, but by participating in climbing, an individual may improve their overall health and lessen some of the impacts of cerebral palsy’s comorbidities. The core, digit flexors, shoulder adductors, elbow flexors, and lumbar flexors are significant muscles that are utilized during climbing, along with

assistance from the lower body, (Deyhle, et al., 2015). By routinely participating in climbing and engaging these muscles, one may improve their core and upper body strength which will assist in maintaining better posture and motor control. Balance and hand-eye coordination can also be advanced with climbing as the climber must hold themselves in a controlled position as they move from one hand, or foot hold, to the next. Functional and physiological tests such as the Sit-to-Stand test, pinch precision and strength tasks done by electromyography, Bio-Sway, range of motion measurements, and Gross Motor Function Classification System can be used as evaluations to observe and monitor any physical advancements gained from climbing, (Schram-Christensen, et al., 2017). A study accomplished by Schram-Christensen and others (2017), overviewed the outcomes of children with cerebral palsy climbing for a three-week period based on results from some of these tests which revealed increases in rate of force development in the hands and fingers and better Sit-to-Stand tests scores. No significant improvements in range of motion of the hands or ankles were observed, but climbing is an activity which requires flexibility and repeatedly shortens and lengthens the muscles, and overtime it may enhance these joints' range of motion, (Seaton, Spring 2022). While increasing flexibility and being a beneficial activity for one's aerobic fitness overall, climbing may also lessen the impacts of the disabilities cerebral palsy creates as it moves the joints and muscles in ways that relax and strengthen them which works against spasticity, can decrease the impacts of osteoporosis as it is a weight bearing exercise, and improve coordination to aid in walking and accomplishing activities of daily living, (Rodio, et al., 2008). Posing many physiological constraints upon the body, climbing is a physical activity that positively impact the health and fitness of individuals with cerebral palsy.

Along with many physical impacts, climbing can have neurological effects and benefits for individuals with disabilities and cerebral palsy too. Evidence is showing that task-specific training can be used in neurological rehabilitation as a neuromotor intervention. Task-specific training is when an individual practices a motor task in a context that is specific to him or her, focusing on improving that task rather than the impairment, (Hubbard, et al., 2009). When considering climbing as a form of therapy, or task-specific training, it may look like finishing a project, or route on a wall, accomplishing a climb in a faster time, or even bouldering over a barrier unassisted. This creates a goal-oriented process that can be extremely beneficial and even enjoyable for individuals with cerebral palsy. Research also suggests that that neural plastic changes can be associated with this training, and that cortico-motor neuron pools are organized by specific tasks rather than certain muscles. Neuroplasticity can be defined as, “the brain’s ability to reorganize itself in response to changes in behavioral demands,” (Hubbard, et al., 2009). So as an individual practices reaching for a handhold, or repeatedly maneuvering their grip or foot placement into different positions, the brain’s motor neurons can become accustomed to this task and organize themselves in such a way as to allow better performance of the task. Associating this with benefitting an individual with cerebral palsy, the movement of reaching for a handhold, gripping it, and pulling oneself up mimics many activities of life such as reaching up and opening a cabinet, picking up a cup, or even lifting oneself out of a chair. Repeating these motions while climbing can allow the brain to by-pass any of its damages and re-route its neuron pathways in a manner that may permit these motions to be done more easily, inside and outside of climbing. When navigating routes, choosing the right gear, and plotting the best pathway, climbing also, “teaches (children) about advanced planning, problem solving, and goal-setting skills,” which are used every day, (NCHPAD, 2021). Practicing these skills while

climbing will not be able to eliminate any mental impairments caused by cerebral palsy, but they are skills which can be improved upon despite these impairments. Climbing will also assist in preventing the ailments from any cognitive impairments from worsening overtime. The activity of climbing is mentally challenging for any person, and even more so for individuals with disabilities, but it is just as valuable in neuromotor development and cognitive processes and thinking skills.

Being an activity that is performed at one's personal level of experience, climbing is still a community-based form of physical activity that offers opportunities for individuals to improve their skills and confidence, become more self-efficient, decrease levels of anxiety, and socialize with others around them. Self-efficacy, or confidence, may be viewed as the beliefs of one's capabilities to accomplish a task, and low levels of self-efficacy can be correlated with higher levels of anxiety which has been identified as one of the most common psychiatric disorders, and one which has the capability to hinder one's quality of life, whether an individual has a disability or not. Exercise has been proven to reduce anxiety and can be used as a mechanism for stress management, and taking that into account, the study done by Aras and Ewert in 2016, looks specifically at the activity of sport rock climbing and its impact on anxiety through an eight-week experiment. Rock climbing can be completed in a controlled environment with fixed anchors, different heights, and different levels. With the lead climbing technique or top rope climbing method, there is little to no risk of falling, and this method is the one being used in the study so as to minimize any fear and to encourage climbers to reach new heights and levels with less concern. Using a type of survey, the Competitive State Anxiety Inventory-2 (CSAI-2,) the anxiety levels of each participant were assessed, and this was completed on the first day by both groups before the initial climb, and on the last day after the final climb to obtain results and

compare. Focusing on cognitive and somatic anxiety, and self confidence levels, a significant decrease in both variations were found, along with an increase in self-confidence at the end of the eight weeks, (Aras, D., & Ewert, A. W., 2016). Rock climbing can be used as an effective tool to decrease anxiety, while also increasing self-confidence, and improve the quality of someone's life. Along with this, it emphasizes the importance and holistic impact physical activity can have on the body. Climbing is also a positive setting for peer socialization and community building as it requires individuals to work with one another while belaying, navigating routes and sharing beta, or information, and creates a welcoming group that even uses its own lingo, (Seaton, Spring 2022). A video produced by the organization, Truth Atlas, in 2014 shows this community in action at an adapted climbing gym in New York. The highlights of the video emphasize how individuals with disabilities feel more confident coming to the gym, and seeing other individuals with disabilities climbing in their own ways. Even though everyone was climbing at different levels of expertise, each individual was using the full potential of their body in different ways to reach the same heights. There are multiple programs and locations available, such as this gym in New York, which offers adapted and para climbing, and databases, like Move United, are available to locate and provide information on these facilities, (NCHPAD, 2021). Individuals with cerebral palsy and other disabilities, may lack confidence in themselves and their capabilities to accomplish tasks and socialize with others. Climbing, however, offers an activity in which they may sociologically benefit from by having control of the level of, and how, he or she climbs, to promote self-efficacy and overall anxiety while being a part of a growing community that they may be fully included in.

Limitations

Even though climbing is a highly adaptable sport, there are many limitations that inhibit research in this area and for climbing to become a common activity for individuals with disabilities. Most environmental factors that limit this are locations and accessibility of climbing facilities, financial costs, and having enough personnel such as trained individuals and aids to work with the individuals, (Castelli et al., 2016). As climbing continues to become a more popular activity and more gyms are being built, unfortunately not all of them are accessible or have the funds to obtain equipment, like full body harnesses or para pull-ups, for individuals with impairments to use. Also, to perform certain physical evaluations to verify any improvements in strength or balance, access to a BioSway machine or equipment to perform an electromyography observation may be required, (Schram-Christensen, et al., 2017). Any other restrictions may come from finances of gear, gym access, or needing aids to be with the individuals with disabilities for any further assistance.

Furthering Research

Due to the troubling circumstances over the past two years, most of the research behind this thesis is media based. Ideally interviews, discussions, and implementing trial sessions of rock climbing for therapy, first hand, would have been accomplished, but given safety, health, and general welfare concerns, this was not so. New, or later, investigations can advance the validation of climbing as a form of therapy by conducting trials that not only evaluate physical advantages, but neurological and social benefits from an individual's climbing experiences, as well. As other researchers have done, this may look like implementing control groups, performing pre- and post-evaluations of muscular strength, endurance, motor control, and coordination, and having participants complete a questionnaire periodically throughout the trials,

or week by week. The questionnaire in use should focus on the emotional status of the participant over the past week and not just at the moment he or she completes it. It should also address self-awareness, self-confidence, constructive collaborations, or social interactions throughout the process so a more comprehensive understanding of the advantages that participating in climbing, or a climbing program, may produce for an individual with disabilities, or any individual at all. To further expand upon this investigation, other populations may be researched, or participate in trials as well to create a broader understanding of how such a form of therapy may profit someone overall.

Conclusion

Rock climbing is a highly adaptable activity that, when instrumented into one's routine, can provide observable physical, cognitive, and sociological benefits for individuals with cerebral palsy. As a therapeutic or recreational based activity, climbing provides multiple ways for any individual, at any level of expertise, with any disability, to be able to participate. Participation requires psychomotor skills, strategic thinking, and partner work with socialization, that with routine training, will improve these aspects and consequently improve the quality of one's daily life overall. Further research and observations of the impacts this activity may have on individuals with cerebral palsy will provide information on how rock climbing can be a feasible and advantageous activity; for these individuals, and for any other population as well, including those with or without disabilities. A rock-climbing program holistically utilizes the human body and provides inclusive opportunities for physical, mental, and social growth for an individual in any recreational or competitive community that they can become a member of.

Bibliography

Americans with Disabilities Act of 1990, Pub. L. No. 101-336, 104 Stat. 328 (1991).

Adata.org. 2021. ADA National Network | Information, Guidance and Training on the

Americans with Disabilities Act. [online] Available at: <<https://adata.org/>> [Accessed 16 March 2021].

Aras, D., & Ewert, A. W. (2016). The effects of eight weeks sport rock climbing training on

anxiety. *Acta Medica Mediterranea*, 32(1), 223-

230. [https://www.researchgate.net/profile/Alan-](https://www.researchgate.net/profile/Alan-Ewert/publication/297732791_The_Effects_of_Eight_Weeks_Sport_Rock_Climbing_Training_on_Anxiety/links/56e1b6e008aec09a8bc08848/The-Effects-of-Eight-Weeks-Sport-Rock-Climbing-Training-on-Anxiety.pdf)

[Ewert/publication/297732791_The_Effects_of_Eight_Weeks_Sport_Rock_Climbing_Tra](https://www.researchgate.net/profile/Alan-Ewert/publication/297732791_The_Effects_of_Eight_Weeks_Sport_Rock_Climbing_Training_on_Anxiety/links/56e1b6e008aec09a8bc08848/The-Effects-of-Eight-Weeks-Sport-Rock-Climbing-Training-on-Anxiety.pdf)

[ining_on_Anxiety/links/56e1b6e008aec09a8bc08848/The-Effects-of-Eight-Weeks-Sport-](https://www.researchgate.net/profile/Alan-Ewert/publication/297732791_The_Effects_of_Eight_Weeks_Sport_Rock_Climbing_Training_on_Anxiety/links/56e1b6e008aec09a8bc08848/The-Effects-of-Eight-Weeks-Sport-Rock-Climbing-Training-on-Anxiety.pdf)

[Rock-Climbing-Training-on-Anxiety.pdf](https://www.researchgate.net/profile/Alan-Ewert/publication/297732791_The_Effects_of_Eight_Weeks_Sport_Rock_Climbing_Training_on_Anxiety/links/56e1b6e008aec09a8bc08848/The-Effects-of-Eight-Weeks-Sport-Rock-Climbing-Training-on-Anxiety.pdf).

Bauman, J., 2022. *Benefits and Barriers To Fitness For Children With Disabilities : NCHPAD –*

Building Inclusive Communities. [online] National Center on Health, Physical Activity and Disability (NCHPAD). Available at:

<[https://www.nchpad.org/173/1308/Benefits~and~Barriers~To~Fitness~For~Children~](https://www.nchpad.org/173/1308/Benefits~and~Barriers~To~Fitness~For~Children~With~Disabilities)

[With~Disabilities](https://www.nchpad.org/173/1308/Benefits~and~Barriers~To~Fitness~For~Children~With~Disabilities).

Castelli, E., Fazzi, E., & SIMFER-SINPIA Intersociety Commission (2016). Recommendations

for the rehabilitation of children with cerebral palsy. *European journal of physical and*

rehabilitation medicine, 52(5), 691–703. <https://pubmed.ncbi.nlm.nih.gov/26629842/>.

Chelette, A. & Reynolds, M., Disabilities and Society Seminar, Fall 2019.

Deyhle, M. R.1; Hsu, H-S.; Fairfield, T. J.; Cadez-Schmidt, T.; Gurney, B. 2; Mermier, C. M.1

Relative Importance of Four Muscle Groups for Indoor Rock-Climbing Performance,
Journal of Strength and Conditioning Research: July 2015 - Volume 29 - Issue 7 - p
2006-2014. doi: 10.1519/JSC.0000000000000823.

Hubbard, I. J., Parsons, M. W., Neilson, C., & Carey, L. M. (2009). Task-specific training:

evidence for and translation to clinical practice. *Occupational therapy international*, 16(3-4), 175-189. [Task-specific training: evidence for and translation to clinical practice - Hubbard - 2009 - Occupational Therapy International - Wiley Online Library.](#)

Move United. 2021. Rock Climbing - Move United. [online] Available at:

<https://www.moveunitedsport.org/sport/rock-climbing/> [Accessed 17 March 2021].

National Center on Health, Physical Activity and Disability (NCHPAD). 2021. *Rock Climbing*

for Children with Disabilities: NCHPAD - Building Inclusive Communities. Available at:

<https://www.nchpad.org/page.php?action=printArticle&content>.

Rand SE., Goerlich C., Marchand K., Jablecki N. The physical therapy prescription. *American*

Family Physician. 2007 Dec 1;76(11):1661-6. PMID: 18092708. [The Physical Therapy Prescription - American Family Physician \(aafp.org\).](#)

Rock Climbing Physical Therapy - Bouldering Physical Therapy. (n.d.). Break Through Physical

Therapy. Retrieved February 28, 2021, from <https://www.breakthroughpt.com/physical-therapy/sports-injury-physical-therapy/rock-climbingbouldering/>.

Rock Climbing Rehab at UC San Diego Health. (2019). *YouTube*. Retrieved February 13, 2021, from [Rock Climbing Rehab at UC San Diego Health](#).

Rodio, A., Fattorini, L., Rosponi, A., Quattrini, F. & Marchetti, M.

(2008). Physiological Adaptation in Noncompetitive Rock Climbers: Good for Aerobic Fitness? *Journal of Strength & Conditioning Research*, 22, 359-364. <https://doi.org/10.1519/JSC.0b013e3181635cd0>.

Sadowska, M., Sarecka-Hujar, B., & Kopyta, I. (2020). Cerebral Palsy: Current Opinions on Definition, Epidemiology, Risk Factors, Classification and Treatment Options. *Neuropsychiatric disease and treatment*, 16, 1505–1518. <https://doi.org/10.2147/NDT.S235165>.

Seaton, S., Indoor Climbing, Seq. 430, Spring 2022.

Schram-Christensen, M., Jensen, T., Voigt, C., Nielsen, J. and Lorentzen, J., 2017. *To be active through indoor-climbing: an exploratory feasibility study in a group of children with cerebral palsy and typically developing children*. NCBI. Available at: <<http://www.ncbi.nlm.nih.gov>> [Accessed 11 March 2021].

Truth Atlas, A New Kind of Physical Therapy. (2014). *YouTube*. Retrieved February 13, 2021, from [A New Kind of Physical Therapy - Rock Climbing for the Disabled](#).

Vitrikas, K., Dalton, H., & Breish, D. (2020). Cerebral Palsy: An Overview. *American family physician*, 101(4), 213–220.

[Cerebral Palsy: An Overview - American Family Physician \(aafp.org\)](#).