ΤΜΗΜΑ ΙΑΤΡΙΚΗΣ
ΣΧΟΛΗ ΕΠΙΣΤΗΜΩΝ ΥΓΕΙΑΣ
ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΙΑΣ

ΠΡΟΓΡΑΜΜΑ ΜΕΤΑΠΤΥΧΙΑΚΩΝ ΣΠΟΥΔΩΝ
«ΝΕΥΡΟΑΠΟΚΑΤΑΣΤΑΣΗ»
Διευθυντής ΠΜΣ: Καθηγητής Ευθύμιος Γ. Δαρδιώτης

Μεταπτυχιακή Διπλωματική Εργασία

«Face to face vs Telerehabilitation in the child population: Systematic Review»

Μακαρώνη Παρασκευή – Άννα

Υπεβλήθη για την εκπλήρωση μέρους των
απαιτήσεων για την απόκτηση του
Μεταπτυχιακού Διπλώματος Ειδίκευσης
«ΝΕΥΡΟΑΠΟΚΑΤΑΣΤΑΣΗ»

ΛΑΡΙΣΑ, ΙΑΝΟΥΑΡΙΟΣ 2024

MEDICAL SCHOOL
HEALTH SCIENCES
UNIVERSITY OF THESSALY

POSTGRADUATE PROGRAM
«NEUROREHABILITATION»
Director: Professor Efthimios G. Dardiotis

Master Thesis

«Face to face vs Telerehabilitation in the child population: Systematic Review»

Makaroni Paraskevi-Anna

Submitted for partial completion of
requirements in order to obtain the
Master of Science Degree on
"NEUROREHABILITATION"

LARISA, JANUARY 2024

«Βεβαιώνω ότι η παρούσα διπλωματική εργασία είναι αποτέλεσμα δικής μου δουλειάς και δεν αποτελεί προϊόν αντιγραφής. Στις δημοσιευμένες ή μη δημοσιευμένες πηγές έχω χρησιμοποιήσει εισαγωγικά και όπου απαιτείται έχω παραθέσει τις πηγές τους στο τμήμα της βιβλιογραφίας.

Υπογραφή: Μακαρώνη Παρασκευή Άννα»

Μακαρώνη Παρασκευή Άννα

ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΙΑΣ ΣΧΟΛΗ ΕΠΙΣΤΗΜΩΝ ΥΓΕΙΑΣ ΤΜΗΜΑ ΙΑΤΡΙΚΗΣ 2024

ΔΙΕΥΘΥΝΤΗΣ ΤΟΥ ΠΡΟΓΡΑΜΜΑΤΟΣ ΜΕΤΑΠΤΥΧΙΑΚΩΝ ΣΠΟΥΔΩΝ

ΕΥΘΥΜΙΟΣ Γ. ΔΑΡΔΙΩΤΗΣ

ΚΑΘΗΓΗΤΗΣ ΝΕΥΡΟΛΟΓΙΑΣ

ΠΑΝΕΠΙΣΤΗΜΙΟΥ ΘΕΣΣΑΛΙΑΣ

Επιβλέπων:

Λάμπρος Μεσσήνης, Τμήμα Ψυχολογίας ΑΠΘ

Τριμελής Συμβουλευτική Επιτροπή:

1. Λάμπρος Μεσσήνης - (Επιβλέπων), Αναπλ. Καθηγητής Νευροψυχολογίας ΑΠΘ

2. Δαρδιώτης Ευθύμιος, Αναπλ. Καθηγητής Νευρολογίας

3. Γρηγόριος Νάσιος, Αναπλ. Καθηγητής Τμήματος Λογοθεραπείας Σχολή Επιστημών Υγείας Πανεπιστήμιο Ιωαννίνων

Τίτλος Εργασίας στα αγγλικά: «Face to face vs Telerehabilitation in the child population: Systematic Review»

CONTENTS

CONTENTS 5
ABSTRACT 7
CHAPTER 1: INTRODUCTION 8
CHAPTER 2: BACKGROUND 10
2.1 Childhood health issues requiring rehabilitation 10
2.1.1 Cerebral palsy 10
2.1.2 Spina bifida 12
2.1.3 Mascular dystrophy 14
2.1.4 Pediatric stroke 16
2.1.5 Traumatic Brain Injury 18
2.1.6 Pediatric cancer 20
2.1.7 Orthopedic conditions 23
2.1.8 Autism Spectrum Disorder 25
2.1.9 Developmental delays 28
2.1.10 Neuromuscular disorders 31
2.1.11 Pediatric arthritis 33
2.2 Reasons for using telerehabilitation compared to face-to-face rehabilitation 35
2.2.1 Accessibility and convenience 35
2.2.2 Family involvement 36
2.2.3 Individualization 38
2.2.4 Adjustment to the family and home environment 39
2.2.5 Implementing telerehabilitation during the pandemic 41
2.2.6 Data tracking and analysis 42
2.2.7 Cost-effective considerations 43
2.2.8 Interdisciplinary collaboration 44
2.2.9 Enhanced language and communication support 45
CHAPTER 3: METHODS 47
3.1 Study design 47
3.2 Search process 53
3.3 Inclusion and exclusion criteria 54
3.4 Quality appraisal 55
CHAPTER 4: RESULTS 56
CHAPTER 5: DISCUSSION 70
CHAPTER 6: CONCLUSIONS 74

REFERENCES 75

ABSTRACT

Background: Tele-rehabilitation might have an advantage over traditional rehabilitation, since it could be more accessible to children living in rural areas and in general to those facing barriers accessing the healthcare system. Tele-rehabilitation could have several advantages compared to traditional rehabilitation, such as increased accessibility, convenience, cost-effectiveness, reduced wait times, enhanced patient engagement, personalized care, improved continuity of care, greater compliance and higher family involvement. Yet, the potential difference in the effect of tele-rehabilitation compared to traditional rehabilitation remains unknown.

Aim: This study examined the potential difference between traditional rehabilitation and tele- rehabilitation in children.

Methods: A search on Pubmed and Scopus was utilized to find related trials. A total of 231 studies were identified through database searching. Two additional records were identified through snowball. A total of 131 studies remained after duplicates removal and were assessed by title. From those studies, 101 were excluded by title, since they were obviously inappropriate. Twenty-four studies did not meet the inclusion and exclusion criteria and, therefore, 6 studies were finally included in the systematic review.

Results: As indicated by the study results, two of the studies indicated no beneficial effects for children, while four studies led to significant positive effects. More specifically, the studies on cerebral palsy and acquired brain injury led to mixed effects, while the study on ADHD patients and patients with organic academia lead to more positive effects for the patients compared to traditional rehabilitation.

Conclusions: Tele- rehabilitation could have further benefits compared to traditional rehabilitation in children with some diseases, although further research in children with other supportive care needs (e.g. autism) is essential to draw related conclusions and to make strong suggestions for the adoption of rehabilitation by healthcare systems.

Key-words: ADHD; brain injury; cerebral palsy; rehabilitation; telerehabilitation

CHAPTER 1: INTRODUCTION

Telerehabilitation and traditional rehabilitation are two different approaches to restoring cognitive function in children who are affected by various disorders. Traditional rehabilitation involves restoring function using traditional methods such as coaching exercises and direct contact with trainers or therapists (Wilson, 1997). On the other hand, telerehabilitation takes advantage of technology to provide rehabilitation through remote access, usually through computers or other electronic devices (Diamond et al., 2003).

A systematic review is a research methodology that summarizes and evaluates available scientific studies on a particular topic (Rys et al., 2009). In this comparative study, we aim to examine the benefits of telerehabilitation as a form of cognitive rehabilitation compared to traditional rehabilitation.

To conduct the study, we evaluated a variety of scientific research that has been conducted in the field of telerehabilitation and traditional rehabilitation, overviewed the results of these studies, including the methodologies used, the population studied, and the measures used to evaluate the results. The purpose of this comparative study is to provide a comprehensive and systematic understanding of the benefits of telerehabilitation versus traditional rehabilitation. The findings of this study can provide a theoretical and practical framework for health professionals and researchers interested in exploring the potential of telerehabilitation as a means of restoring cognitive function.

Regarding the structure of the study, the background examines various causes that lead to the lead of rehabilitation in childhood, which all lead to significant cognitive deficits and, in general, to the need of rehabilitation. Followingly, potential advantages of telerehabilitation compared to face-to-face rehabilitation are noted. At next, the relevant systematic review is presented, in order to investigate the potential advantage of telerehabilitation compared to the face-to-face approach. Finally, the study leads to overall conclusions, suggestions for future research and practical implications.

In summary, this study aims to review and evaluate scientific studies related to telerehabilitation and traditional rehabilitation in order to better understand the benefits and challenges of each form of rehabilitation. In doing so, we can provide essential

information and guidelines to help further develop and improve rehabilitation programs for children with cognitive disabilities.

CHAPTER 2: BACKGROUND

2.1 Childhood health issues requiring rehabilitation

2.1.1 Cerebral palsy

Cerebral palsy (CP) is a complex neurological disorder that has an impact on movement and muscle coordination. It is one of the most frequent childhood disability, with various levels of severity and a wide range of associated challenges (Vitrakas et al., 2020; Chelban et al., 2019; Clarimon et al., 2005; Dardiotis et al., 2014).

Regarding its causes, CP is primarily developed by damage to the developing brain, typically taking place before, during, or shortly after birth. The exact causes can be multifactorial and may include prenatal factors such as infections or maternal health issues, perinatal factors like oxygen deprivation during birth, and postnatal factors such as head injuries or infections. While the specific cause of CP can be challenging to pinpoint, it is essential to point out that it is not a hereditary condition and does not progress over time (Vitrakas et al., 2020).

CP encompasses a spectrum of motor impairments that can vary widely in terms of severity and the parts of the body affected. The four main types of cerebral palsy are (Vitrakas et al., 2020):

1. Spastic CP: This is the most frequent type and is characterized by stiff and tight muscles, making movement difficult.
2. Dyskinetic-Athetoid CP: Patients with this type have involuntary and uncontrollable movements, making it challenging to control their limbs.
3. Ataxic CP: This type primarily affects coordination and balance, making precise movements and fine motor skills challenging.
4. Mixed CP: Some patients may exhibit a combination of the above types, presenting a more complex set of challenges.

The symptoms of cerebral palsy can manifest in a variety of ways, based on the type and severity of the condition. Usual symptoms include muscle stiffness, muscle weakness, difficulty with fine motor skills, poor coordination, balance issues, and involuntary movements. Diagnosis often occurs in infancy or early childhood when developmental delays or unusual movement patterns are observed. Physicians may use a combination of medical history, physical exams, and imaging studies like MRI or CT scans to diagnose CP (Michael-Asalu et al., 2019).

While cerebral palsy is not curable, there are numerous treatment choices and interventions available to manage its symptoms and improve the quality of life for individuals with CP. These may include (Michael-Asalu et al., 2019; Vitrakas et al., 2020):

- Physical Therapy: Physical therapy is a cornerstone of CP management, focusing on improving muscle strength, mobility, and flexibility.
- Occupational Therapy: Occupational therapists work to enhance daily living skills, fine motor skills, and independence.
- Speech Therapy: For individuals with speech difficulties, speech therapy can be immensely beneficial in improving communication.
- Medications: Medications may be prescribed to manage muscle spasms, pain, or other associated conditions.
- Orthopedic Interventions: Orthopedic surgeries may be necessary to correct bone and joint issues, such as scoliosis or hip dislocations.
- Assistive Devices: Mobility aids, communication devices, and adaptive equipment can significantly improve a patient’s independence and quality of life.

Living with cerebral palsy can present unique challenges, both for individuals with CP and their families. However, it's essential to emphasize that individuals with CP can lead fulfilling lives, pursue education, employment, and engage in recreational activities with the right support and accommodations. Supportive environments, inclusive communities, and advancements in assistive technology have empowered

many people with CP to overcome obstacles and achieve their goals. Yet, it is out of doubt that CP leads to a negative impact for the patients' quality of life (Gilson et al., 2014).

In general, CP is a complex and diverse condition that requires a multidisciplinary approach to treatment and management. With early diagnosis, appropriate interventions, and ongoing support, individuals with CP can thrive and lead meaningful lives, demonstrating the remarkable resilience of the human spirit in the face of adversity. Increased awareness, research, and advocacy continue to drive improvements in the care and opportunities available to those living with CP (Vitrakas et al., 2020; Dardiotis et al., 2019; Dardiotis et al., 2017; Dardiotis et al., 2020).

2.1.2 Spina bifida

Spina bifida is a congenital neural tube defect that affects thousands of children worldwide. This condition is developed when the neural tube, which eventually develops into the brain and spinal cord, doesn't close properly during early embryonic development (Iskandar & Finnell, 2022).

Spina bifida's exact cause is not fully understood, but it is believed to result from a combination of genetic and environmental factors. The risk of spina bifida is influenced by factors such as maternal nutrition, exposure to certain medications or toxins during pregnancy, and a family history of neural tube defects. Folate supplementation during pregnancy has been shown to significantly minimize the risk of spina bifida (Copp et al., 2015).

Spina bifida is categorized into three main types, each with varying degrees of severity (Copp et al., 2015; Iskandar & Finnell, 2022; Arseniou et al., 2020; Liampas et al. 2024).:

1. Spina Bifida Occulta: In this mildest form, there is a small gap in one or more of the vertebrae (bones of the spine), but the spinal cord and meninges (protective covering) remain within the spinal canal. Often, there are no visible symptoms or neurological problems.

2. Meningocele: In this less common form, a sac containing the meninges protrudes through an opening in the spine. The spinal cord remains intact, and surgical repair can typically lead to a good outcome.

3. Myelomeningocele (Spina Bifida Cystica): This is the most severe form, where both the meninges and the spinal cord protrude through the opening in the spine. Myelomeningocele requires surgery to repair the spinal defect and often leads to varying degrees of permanent disability.

The symptoms of spina bifida can vary widely depending on the type and degree of the condition. Common symptoms include physical disabilities, such as paralysis, orthopedic deformities, bowel and bladder dysfunction, and in some cases, intellectual or learning disabilities. Spina bifida is typically diagnosed during pregnancy through prenatal screening or after birth through physical examination and imaging tests like ultrasound or MRI (Copp et al., 2015; Iskandar & Finnell, 2022; Liampas et al. 2020; Rikos et al., 2022; Siokas et al., 2020).

The treatment and management of spina bifida aim to address the specific needs and challenges faced by each child. Key components of care include (Copp et al., 2015):

- Surgery: Children born with myelomeningocele usually require surgical closure of the spinal defect within the first few days or weeks of life to prevent infection and further damage to the spinal cord.

- Physical and Occupational Therapy: These therapies help improve muscle strength, mobility, and daily living skills.

- Management of Complications: Children with spina bifida often need ongoing medical care to address issues such as hydrocephalus (excess fluid in the brain), urinary tract infections, and orthopedic problems.

- Educational Support: Some children may require specialized educational services to address learning disabilities or developmental delays.

- Assistive Devices: Wheelchairs, braces, and other assistive devices can enhance mobility and independence.

Living with spina bifida can present various challenges, but with the right medical care, support, and early interventions, many children with this condition can lead fulfilling lives. Advances in medical treatments, assistive technology, and increased awareness of spina bifida have significantly improved the prospects for affected children, allowing them to pursue education, employment, and recreational activities (Copp et al., 2015; Iskandar & Finnell, 2022; Siokas et al., 2022; Sokratous et al., 2016; Stamati et al. 2019; Yagolovich et al. 2024).

In overall, spina bifida in childhood is a complex condition that requires a multidisciplinary approach to care. With early diagnosis, appropriate interventions, and a supportive network of healthcare professionals and family members, children with spina bifida can overcome many of the challenges associated with this condition and thrive in all aspects of their lives. Research into treatments and interventions continues to advance, offering hope for an even brighter future for children living with spina bifida (Sandler, 2010).

2.1.3 Mascular dystrophy

Muscular dystrophy (MD) is a group of genetic disorders characterized by progressive muscle weakness and degeneration (Emery, 2002). While there are several types of MD, many of them can affect children, and the impact on their lives can be profound (Mercuri & Muntoni, 2013; Dardiotis et al., 2019; Dewan et al., 2021; Hadjigeorgiou et al., 2019).

Regarding its causes, MD is primarily caused by genetic mutations that interfere with the production of proteins essential for muscle health. These mutations can be inherited from one or both parents or may occur spontaneously. The specific gene affected determines the type of muscular dystrophy and its severity (Mercuri & Muntoni, 2013).

There are several types of MD, each with its unique characteristics. The most common types that affect children include (Lue et al., 2009):

1. Duchenne Muscular Dystrophy (DMD): This is the most prevalent and severe form of MD in children. It primarily affects boys, causing progressive muscle weakness and typically leading to mobility issues and respiratory problems.
2. Becker Muscular Dystrophy (BMD): Similar to DMD but less severe, BMD also affects boys and leads to progressive muscle weakness.
3. Congenital Muscular Dystrophy (CMD): This rare form of MD presents at birth or in early infancy, causing muscle weakness and joint stiffness.
4. Facioscapulohumeral Muscular Dystrophy (FSHD): FSHD typically manifests in adolescence and affects the muscles of the face, shoulders, and upper arms.

The disease is characterized by progressive muscle wasting and weakness. Symptoms can vary depending on the specific type of MD, but common signs include difficulty walking, frequent falls, muscle cramps, and delayed motor milestones in early childhood. Diagnosis often involves a combination of physical exams, genetic testing, and muscle biopsies to confirm the type of MD and assess its severity (Mercuri & Muntoni, 2013).

While there is no cure for MD, various treatment approaches aim to manage symptoms, slow disease progression, and improve the quality of life for affected children. These may include (Goyenvalle et al., 2011; Jang et al., 2018; Liampas et al., 2024; Liampas et al., 2020):

- Physical Therapy: Physical therapists work with children to maintain muscle strength, mobility, and range of motion.
- Occupational Therapy: Occupational therapists help children with the disease develop skills for daily living, such as dressing and eating.
- Respiratory Care: As the disease can affect the muscles needed for breathing, respiratory therapy and devices like ventilators may be necessary.
- Medications: Some medications, such as corticosteroids, may help slow muscle degeneration and manage symptoms.
- Surgery: Orthopedic surgeries may be required to address complications like scoliosis or joint contractures.

- Supportive Devices: Mobility aids like wheelchairs or braces, along with assistive technology, can enhance independence and accessibility.

Living with MD can be challenging, both physically and emotionally. Affected children may face mobility limitations, social isolation, and the need for ongoing medical care. However, with early diagnosis, a multidisciplinary approach to care, and a strong support system, many children with MD can lead fulfilling lives, pursue education, engage in activities they enjoy, and form meaningful relationships (Grootenhuis et al., 2007).

In general, MD in childhood is a complex condition that requires ongoing care and support. While there is currently no cure, advances in research and medical treatments continue to improve the outlook for affected children. With comprehensive care, access to assistive technology, and a supportive community, children with MD can overcome many of the challenges associated with this condition and thrive as active participants in their families and communities. Awareness and advocacy play vital roles in ensuring that children with MD receive the care and support they need to reach their full potential (Mercuri & Muntoni, 2013).

2.1.4 Pediatric stroke

Pediatric stroke is a relatively rare but serious medical condition that affects children. It occurs when there is a disruption in the blood supply to a part of the child's brain, leading to a wide range of neurological symptoms (Rawanduzy et al., 2022).

Pediatric stroke can result from a variety of factors, some of which are unique to children. These include (Rawanduzy et al., 2022; Luijten et al., 2021; Mamalaki et al., 2018; Michelakakis et al., 2012):

1. Congenital Heart Defects: Some children are born with heart conditions that increase the risk of blood clots, which can travel to the brain and cause a stroke.
2. Blood Disorders: Conditions like sickle cell disease or other blood clotting disorders can predispose children to stroke.

3. Infections: Certain infections, such as meningitis or encephalitis, can lead to inflammation of blood vessels and increase the risk of stroke.
4. Trauma: Head injuries, although less common, can result in stroke if they damage blood vessels or disrupt blood flow to the brain.

Pediatric stroke can be broadly categorized into two main types (Cárdenas et al., 2011):

1. Ischemic Stroke: This type occurs when a blood clot or other blockage disrupts blood flow to the brain. Ischemic strokes are more common in children than hemorrhagic strokes.
2. Hemorrhagic Stroke: Hemorrhagic strokes result from bleeding within the brain, often due to a ruptured blood vessel. These are less common but tend to be more severe.

The symptoms of pediatric stroke can vary depending on the child's age, the location of the stroke, and its severity. Common symptoms may include sudden weakness or numbness on one side of the body, difficulty speaking or understanding language, severe headaches, and seizures. Diagnosing pediatric stroke often involves a combination of clinical evaluation, brain imaging (such as MRI or CT scans), and blood tests (Cárdenas et al., 2011; Rawanduzy et al., 2022):

Prompt and appropriate treatment is crucial in managing pediatric stroke and minimizing its long-term effects. Treatment may include (Jordan & Hillis, 2011):

- Medication: In the case of ischemic stroke, medications like tissue plasminogen activator (tPA) may be administered to dissolve blood clots. For hemorrhagic stroke, interventions to control bleeding and manage increased intracranial pressure are essential.
- Surgery: In some cases, surgery may be required to remove a blood clot or repair damaged blood vessels.

- Rehabilitation: Rehabilitation, including physical therapy, occupational therapy, and speech therapy, plays a significant role in helping children regain lost skills and adapt to any disabilities caused by the stroke.
- Preventive Measures: Depending on the underlying cause, preventive measures such as anticoagulant therapy or managing risk factors like heart conditions may be necessary to reduce the risk of recurrent strokes.

Pediatric stroke can have a profound impact on a child's life and their family. Depending on the severity of the stroke, children may experience physical or cognitive impairments that require ongoing care and support. Families often face emotional, financial, and logistical challenges in providing the necessary care and therapies for their child. However, with early intervention and a comprehensive care team, many children can make significant improvements in their abilities and quality of life (Gordon et al., 2018).

In general, pediatric stroke is a serious medical condition that requires prompt recognition and treatment. While it can be a challenging and life-altering experience for both children and their families, advancements in medical care and rehabilitation therapies offer hope for recovery and improved outcomes. Increased awareness, early diagnosis, and access to specialized pediatric stroke care are essential in ensuring that affected children receive the support they need to reach their full potential and lead fulfilling lives (Rawanduzy et al., 2022).

2.1.5 Traumatic Brain Injury

Traumatic Brain Injury (TBI) in childhood is a significant and complex medical condition that can have far-reaching effects on a child's physical, cognitive, emotional, and social development. Those injuries in children are typically caused by a sudden blow or jolt to the head. Common causes include (Thurman, 2016; Nousia et al., 2021; Siokas et al., 2017; Tsika et al., 2024; Zafiriou et al., 2021):

1. Falls: Falls from playground equipment, furniture, stairs, or other elevated surfaces are a leading cause of TBI in young children.
2. Motor Vehicle Accidents: Car crashes and accidents involving bicycles, skateboards, or pedestrians can result in TBI.
3. Sports and Recreational Activities: Participation in contact sports, such as football or soccer, and recreational activities like riding bikes or skateboarding can lead to head injuries.
4. Abuse: Physical abuse can also cause TBI in children.

Those injuries can vary in severity and type. Common classifications include (Honda et al., 2022):

1. Concussion: A mild TBI often associated with temporary loss of consciousness, confusion, and headache.
2. Contusion: A bruise or bleeding on the brain's surface.
3. Intracerebral Hemorrhage: Bleeding within the brain tissue itself.
4. Diffuse Axonal Injury (DAI): Widespread damage to the brain's white matter fibers, typically resulting from strong rotational forces, such as in car accidents.

The symptoms of TBI in children can be subtle and may not appear immediately after the injury. They can include headaches, dizziness, nausea, vomiting, confusion, changes in behavior or mood, difficulty with coordination, and problems with memory or concentration. Diagnosis often involves a thorough medical evaluation, including neurological exams, imaging scans (CT or MRI), and consideration of the injury's mechanism (Kim & Gean, 2011).

Treatment for pediatric TBI is tailored to the injury's severity and specific needs of the child. It may include (Galgano et al., 2017):

- Monitoring: Children with mild TBI may require observation at home, while moderate to severe cases may necessitate hospitalization and close monitoring.

- Medication: Medications may be prescribed to manage symptoms such as pain, seizures, or behavioral issues.
- Surgery: In cases of severe TBI with bleeding or swelling, surgery may be required to relieve pressure and remove blood clots or damaged tissue.
- Rehabilitation: Rehabilitation is a crucial component of TBI treatment, focusing on physical, occupational, and speech therapies to address physical and cognitive deficits.
- Counseling and Psychosocial Support: Children and their families may benefit from counseling to address emotional and behavioral challenges associated with TBI.

The impact of TBI on a child's life can be significant and long-lasting. Some children may experience ongoing physical disabilities, cognitive impairments, or emotional and behavioral difficulties. Rehabilitation, education, and support services can help children adapt and develop strategies to overcome these challenges. Families often play a critical role in providing ongoing care and support, and they may require access to resources and support groups to help them navigate the complexities of TBI in childhood (Galgano et al., 2017; Martin, 1988).

In conclusion TBI in childhood is a complex medical condition that requires a multidisciplinary approach to diagnosis, treatment, and ongoing care. Advances in medical understanding and rehabilitation techniques have improved the outlook for children with TBI, but it remains a challenging journey for both children and their families. Increased awareness, prevention measures, and access to specialized care are essential in ensuring that children affected by TBI have the best possible chances for recovery (Galgano et al., 2017).

2.1.6 Pediatric cancer

Pediatric cancer is a devastating and complex medical condition that affects children and adolescents. It encompasses various types of cancers that can develop in young individuals, ranging from infancy to young adulthood (Baliga & Yock, 2020).

The exact causes of pediatric cancer are not always clear, but it is believed to result from a combination of genetic, environmental, and sometimes random factors. Unlike adult cancers, pediatric cancers are often not associated with lifestyle choices, such as smoking or diet. Genetic predispositions, exposure to radiation, certain chemicals, or infections may increase the risk of pediatric cancer (Baliga & Yock, 2020).

Pediatric cancer encompasses a wide range of cancer types, including but not limited to (Baliga & Yock, 2020; Siegel et al., 2023):

1. Leukemia: The most common childhood cancer, affecting the blood and bone marrow.
2. Brain and Central Nervous System (CNS) Tumors: These can include gliomas, medulloblastomas, and other brain tumors.
3. Neuroblastoma: A cancer that typically begins in the adrenal glands but can also develop in nerve tissue along the spine.
4. Wilms Tumor: A type of kidney cancer that primarily affects children.
5. Lymphoma: Hodgkin and non-Hodgkin lymphomas can occur in children and adolescents.
6. Rhabdomyosarcoma: A cancer that starts in the muscles.
7. Osteosarcoma: A rare form of bone cancer that can occur in children and young adults.

The symptoms of pediatric cancer can vary widely depending on the type and location of the tumor. Common signs include unexplained weight loss, fatigue, pain, persistent fevers, changes in vision, lumps or masses, and changes in blood counts. Those symptoms can be attributed most of the time in leukemia, brain and other nervous system tumors, which are the leading types of cancer in childhood (Siegel et al., 2023). Diagnosis often involves a combination of physical exams, imaging studies (X-rays, CT scans, MRIs), blood tests, and, in some cases, biopsies to confirm the type of cancer.

Pediatric cancer treatment is highly specialized and typically involves a multidisciplinary team of healthcare professionals. Treatment modalities may include (Erdmann et al., 2021):

- Chemotherapy: The use of powerful drugs to kill cancer cells or stop their growth.
- Radiation Therapy: High-energy radiation is used to target and shrink tumors.
- Surgery: Surgical removal of tumors or affected tissues is often necessary.
- Stem Cell Transplant: In certain cases, stem cell or bone marrow transplants may be performed.
- Targeted Therapies: These drugs are designed to specifically target cancer cells with minimal impact on healthy tissues.
- Immunotherapy: Some forms of immunotherapy help the immune system recognize and attack cancer cells.

During the latest decades, significant advances have been made to treat pediatric cancer and prolong the survival of those affected. According to the American Cancer Society, the 5-year survival rate of pediatric cancer patients has improved from 58% during the 70's to more than 85%, leading to increased supportive care needs for this expanding patient population (Siegel et al., 2023). A diagnosis of pediatric cancer can be overwhelming for both the child and their family. It often disrupts normal routines and can lead to physical, emotional, and financial challenges. Pediatric cancer patients may experience side effects from treatment, long hospital stays, and missed school. Families may face substantial emotional stress and financial burdens. However, with advances in treatment and support from healthcare professionals many children can overcome the negative experience of cancer (Askins & Moore, 2008).

In conclusion, pediatric cancer is a deeply challenging and heart-wrenching medical condition that affects not only the child but also their family and community. Early diagnosis, access to specialized care, and ongoing research efforts are essential to improving the prognosis and quality of life for children battling cancer. Increased awareness, fundraising, and support for pediatric cancer research are vital to accelerate the research and find better treatments for pediatric cancer (Leisenring et al., 2009).

2.1.7 Orthopedic conditions

Orthopedic conditions in childhood encompass a wide range of musculoskeletal disorders and abnormalities that affect the bones, joints, muscles, ligaments, and tendons in children. These conditions can vary in severity, from minor issues that resolve with minimal intervention to complex and chronic conditions that require long-term management and sometimes surgical intervention (Nemeth, 2011).

Orthopedic conditions in children can arise from various factors, including (Bent et al., 2020):

1. Congenital Factors: Some orthopedic conditions are present at birth due to genetic or developmental factors. A relevant example is congenital hip dysplasia.
2. Trauma: Accidents, falls, and sports injuries can lead to fractures, dislocations, and ligament injuries.
3. Infections: Infections that affect the bones and joints, such as osteomyelitis or septic arthritis, can cause orthopedic problems.
4. Inflammatory Conditions: Autoimmune disorders like juvenile idiopathic arthritis (JIA) can affect the joints and cause orthopedic symptoms.
5. Neuromuscular Disorders: Conditions like cerebral palsy or muscular dystrophy can result in musculoskeletal deformities.

Types of Orthopedic Conditions in Childhood: Orthopedic conditions in children encompass a wide array of disorders, including but not limited to (Bent et al., 2020; Nemeth, 2011):

1. Scoliosis: Abnormal curvature of the spine, which can affect posture and mobility.
2. Hip Dysplasia: An abnormal development of the hip joint, which can lead to hip instability and early arthritis if left untreated.

3. Clubfoot: A congenital condition where the feet turn inward and downward, requiring early intervention with casting or surgery.
4. Legg-Calvé-Perthes Disease: A condition affecting the hip joint where the blood supply to the femoral head is compromised.
5. Osteogenesis Imperfecta: A genetic disorder characterized by brittle bones prone to fractures.
6. Developmental Dysplasia of the Hip (DDH): Abnormal hip joint development, which can lead to hip dislocation.
7. Fractures: Broken bones, which are common in active children but may require special attention in some cases.
8. Limb Length Discrepancies: Differences in the length of the arms or legs, which can be congenital or result from injury or surgery.

The symptoms of orthopedic conditions in children can vary widely based on the specific condition. Common symptoms include pain, limited range of motion, deformities, gait abnormalities, and muscle weakness. Diagnosis often involves a combination of physical exams, medical history review, imaging studies (X-rays, MRI, CT scans), and sometimes laboratory tests to rule out infections or autoimmune disorders (Nemeth, 2011).

Treatment for orthopedic conditions in childhood is tailored to the specific diagnosis and the child's age and needs. It may involve (Nemeth, 2011):

- Conservative Measures: Some conditions can be managed with non-surgical interventions such as physical therapy, bracing, casting, or medication.
- Surgery: Surgical procedures may be necessary to correct deformities, stabilize joints, or address other issues.
- Orthopedic Devices: The use of orthotics, prosthetics, or assistive devices to improve mobility and function.
- Rehabilitation: Physical and occupational therapy to improve strength, range of motion, and overall function.

- Pain Management: Medications and pain management strategies to alleviate discomfort.

Children with orthopedic conditions often require ongoing care and support. This may include regular follow-up appointments, rehabilitation sessions, and lifestyle adjustments to accommodate their condition. Families play a crucial role in providing emotional and practical support to children with orthopedic conditions, ensuring they have the best possible quality of life (Cohen, 1999).

In conclusion, orthopedic conditions in childhood present unique challenges that require specialized care and ongoing management. Early diagnosis and intervention are crucial to optimizing outcomes for affected children. Advances in orthopedic treatments, including surgical techniques and rehabilitation approaches, continue to improve the prospects for children with these conditions. Increased awareness, support, and access to care are essential to ensure that children with orthopedic conditions overcome the disease (Bent et al., 2020; Cohen, 1999; Nemeth, 2011).

2.1.8 Autism Spectrum Disorder

Autism Spectrum Disorder (ASD) is a complex and heterogeneous neurodevelopmental condition that significantly impacts children's social interactions, communication abilities, behavior, and sensory processing. This disorder is diagnosed through a spectrum because it manifests differently in each individual, varying in severity and presenting a wide range of challenges and strengths (Lightfoot et al., 2014).

The exact causes of ASD remain a subject of ongoing research, but it is widely believed to result from a combination of genetic and environmental factors. These factors can include prenatal influences, genetic mutations, advanced parental age, and certain environmental factors, although no single cause has been identified (Lightfoot et al., 2014).

The disorder is characterized by a diverse range of symptoms, and the severity of these symptoms can vary widely from person to person. Common signs and symptoms of ASD in childhood may include (Wenar & Kerig, 2008):

1. Social Challenges: Difficulty with social interactions, including making and maintaining friendships, understanding emotions, and interpreting social cues.
2. Communication Difficulties: Delayed speech and language development, difficulty with non-verbal communication (such as gestures or eye contact), and repetitive language.
3. Repetitive Behaviors: Engaging in repetitive movements or activities, such as hand-flapping, rocking, or repeating certain phrases.
4. Rigidity and Routine: A strong preference for routine and difficulty adapting to changes in schedule or environment.
5. Sensory Sensitivities: Heightened or diminished sensitivity to sensory stimuli, which can lead to sensory overload or under-responsiveness.
6. Restricted Interests: Intense focus on specific topics or interests, often to the exclusion of other activities.

Diagnosis of ASD typically involves a comprehensive assessment conducted by a team of healthcare professionals, including pediatricians, developmental specialists, psychologists, and speech therapists. Standardized tests and observations are used to evaluate the child's communication, social, and behavioral patterns (American Psychiatric Association, 2013).

As mentioned above, this disorder encompasses a spectrum, and children can be diagnosed with different conditions along this spectrum. While the term "Autism Spectrum Disorder" is commonly used, it includes several specific diagnoses, such as (American Psychiatric Association, 2013):

1. Autistic Disorder (Classic Autism): Characterized by severe social and communication challenges, along with restricted and repetitive behaviors.

2. Asperger's Syndrome: Marked by difficulties in social interactions and communication but often with less pronounced language delays or cognitive impairments.
3. Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS): A diagnosis used for children who exhibit some, but not all, of the typical symptoms of ASD.

There is no cure for ASD, but early intervention and various therapeutic approaches can significantly improve the quality of life for children with the condition. Common treatment options include (Wenar & Kerig, 2008):

- Behavioral Interventions: Applied Behavior Analysis (ABA) and other behavioral therapies can help children develop social, communication, and behavioral skills.
- Speech and Language Therapy: Speech therapists work with children to improve communication abilities and address language delays.
- Occupational Therapy: Occupational therapists help children develop fine motor skills, address sensory sensitivities, and improve daily living skills.
- Medications: In some cases, medications may be prescribed to manage associated symptoms such as anxiety, aggression, or hyperactivity.
- Educational Support: Special education services and Individualized Education Programs (IEPs) are designed to meet the unique educational needs of children with ASD.

Living with ASD presents both challenges and strengths. Children with ASD often benefit from structured routines, specialized education, and ongoing support from their families, educators, and healthcare providers. While individuals with ASD may face social and communication difficulties, they can also possess unique talents and abilities. Embracing these strengths and providing a supportive environment can help children with ASD thrive and achieve their full potential (Lightfoot et al., 2014).

In general, ASD in childhood are complex and diverse, with each child presenting a unique set of strengths and challenges. Early diagnosis, tailored interventions, and a supportive network of professionals and family members are essential in helping children with ASD reach their full potential (Lightfoot et al., 2014).

2.1.9 Developmental delays

Developmental delays in childhood refer to a broad spectrum of conditions in which children do not reach the developmental milestones expected for their age. These delays can affect various aspects of a child's development, including physical, cognitive, communication, social, and emotional skills (Lightfoot et al., 2014).

Developmental delays can have a range of causes, which may include genetic factors, prenatal influences, birth complications, medical conditions, environmental factors, or a combination of these. Common causes of developmental delays include (Lightfoot et al., 2014):

1. Genetic Disorders: Some children are born with genetic conditions that affect their development, such as Down syndrome or Fragile X syndrome.
2. Premature Birth: Babies born prematurely may experience delays in their development due to their underdeveloped organs and systems.
3. Prenatal Exposure: Exposure to drugs, alcohol, infections, or other toxins during pregnancy can lead to developmental issues.
4. Birth Complications: Complications during childbirth, such as oxygen deprivation, can result in developmental delays.
5. Neurological Conditions: Conditions like cerebral palsy, epilepsy, or traumatic brain injury can impact a child's development.
6. Environmental Factors: A lack of stimulating or supportive environments can contribute to developmental delays, particularly in cases of neglect or extreme poverty.

Developmental delays can manifest in various ways, leading to different types of delays, including but not limited to (Lightfoot et al., 2014):

1. Gross Motor Delays: These affect a child's ability to control large muscle groups and perform activities such as crawling, walking, or running.
2. Fine Motor Delays: These impact the development of small muscle groups and skills like grasping objects, drawing, or using utensils.
3. Cognitive Delays: Cognitive delays affect a child's ability to think, reason, solve problems, and learn.
4. Speech and Language Delays: These delays can result in difficulties with communication, including speech production, understanding language, or expressing thoughts and feelings.
5. Social and Emotional Delays: Children with these delays may have difficulty forming relationships, understanding and managing emotions, or interpreting social cues.

The symptoms of developmental delays vary depending on the specific area affected and the severity of the delay. Common signs may include (Wenar & Kerig, 2008):

- Difficulty reaching developmental milestones: Such as sitting, crawling, walking, talking, or using the toilet.
- Persistent challenges in social interactions: Such as difficulty making friends or understanding social cues.
- Communication difficulties: Including limited speech or difficulty understanding and using language.
- Behavioral issues: Such as frequent tantrums, aggression, or withdrawal.

Diagnosing developmental delays typically involves a comprehensive assessment conducted by healthcare professionals, including pediatricians, developmental specialists, psychologists, speech therapists, and occupational therapists. Standardized

tests and developmental milestones are used to evaluate a child's progress and identify areas of concern (Wenar & Kerig, 2008).

Early intervention is crucial in addressing developmental delays. Treatment and management strategies may include (Lightfoot et al., 2014; Wenar & Kerig, 2008):

- Early Intervention Services: These services, provided through government programs, offer therapies such as physical therapy, occupational therapy, and speech therapy.
- Special Education: Children with developmental delays may benefit from specialized educational programs that address their specific needs.
- Behavioral Therapy: Applied Behavior Analysis (ABA) and other behavioral therapies can help children develop social, communication, and behavioral skills.
- Medications: In some cases, medications may be prescribed to manage symptoms or underlying conditions contributing to the delays.

Living with developmental delays can be challenging for both children and their families. Children may require ongoing therapy and support to reach their full potential. Families often play a central role in providing emotional, educational, and practical support, working closely with healthcare professionals to develop and implement individualized plans to address the child's unique needs (Lightfoot et al., 2014).

In conclusion, developmental delays in childhood encompass a wide range of conditions that require early diagnosis, intervention, and support. With appropriate treatment and a supportive network of healthcare professionals, educators, and family members, children with developmental delays can make significant progress in their development and lead fulfilling lives. Increased awareness, access to early intervention services, and research efforts continue to improve outcomes for children affected by those delays are warranted (Lightfoot et al., 2014).

2.1.10 Neuromuscular disorders

Neuromuscular disorders in childhood encompass a group of diverse and often rare conditions that affect the nervous system's control over muscles (McMillan et al., 2011). These disorders can have a profound impact on a child's motor function, mobility, and overall quality of life (Orcesi et al., 2014). Neuromuscular disorders in children can have various causes, including genetic mutations, autoimmune reactions, infections, or metabolic abnormalities. Some common causes include (Lightfoot et al., 2014; McMillan et al., 2011; Stübgen, 2011):

1. Genetic Factors: Many neuromuscular disorders are inherited, such as Duchenne muscular dystrophy, spinal muscular atrophy, and Charcot-Marie-Tooth disease.
2. Autoimmune Reactions: Conditions like myasthenia gravis involve the immune system attacking neuromuscular junctions.
3. Infections: Certain infections, such as Guillain-Barré syndrome, can lead to temporary neuromuscular dysfunction.
4. Metabolic Disorders: Conditions like Pompe disease can result from metabolic enzyme deficiencies, leading to neuromuscular issues.

There is a wide spectrum of neuromuscular disorders in childhood, each with unique characteristics and presentations. Some common types include (Andersson & Rando, 1999):

1. Muscular Dystrophy: A group of genetic disorders characterized by progressive muscle weakness and wasting. Duchenne muscular dystrophy is one of the most well-known forms.
2. Spinal Muscular Atrophy (SMA): A genetic disorder affecting motor neurons in the spinal cord, leading to muscle weakness and atrophy.
3. Myasthenia Gravis: An autoimmune disorder that affects neuromuscular junctions, causing muscle weakness and fatigue.
4. Guillain-Barré Syndrome: An autoimmune condition that can lead to muscle weakness and paralysis.

5. Charcot-Marie-Tooth Disease: A hereditary neuropathy affecting peripheral nerves, leading to muscle weakness and sensory deficits.
6. Congenital Myopathies: A group of genetic disorders that result in muscle weakness present at birth or in early childhood.
7. Metabolic Myopathies: Conditions like Pompe disease or McArdle disease result from metabolic enzyme deficiencies, leading to muscle weakness.

Symptoms of neuromuscular disorders in childhood can vary widely, but common signs include muscle weakness, fatigue, difficulty with mobility and coordination, muscle cramps, and altered reflexes. Diagnosis often involves a combination of clinical evaluation, genetic testing, nerve conduction studies, electromyography (EMG), muscle biopsies, and imaging studies such as MRI (Andersson & Rando, 1999).

While many neuromuscular disorders in childhood have no cure, various treatment options aim to manage symptoms, slow disease progression, and improve the child's quality of life. Treatment approaches may include (Dowling et al., 2018; Strehle, 2009):

- Physical and Occupational Therapy: These therapies help children maintain muscle strength, improve mobility, and learn adaptive strategies for daily living.
- Medications: Some medications may help manage symptoms or slow disease progression. For example, corticosteroids are used in muscular dystrophy.
- Assistive Devices: Mobility aids like wheelchairs, braces, and orthotics can enhance independence and accessibility.
- Respiratory Care: Some neuromuscular disorders can affect respiratory muscles, requiring respiratory therapies and potentially ventilator support.
- Surgical Interventions: In some cases, surgical procedures may be necessary to address complications or improve mobility.

Living with a neuromuscular disorder in childhood can be challenging, both physically and emotionally. Children and their families may face mobility limitations, social isolation, and the need for ongoing medical care. However, with early diagnosis,

comprehensive care, access to assistive technology, and a supportive community, many children with neuromuscular disorders can lead fulfilling lives, pursue education, engage in activities they enjoy, and form meaningful relationships (Bray et al., 2010).

In overall, neuromuscular disorders in childhood are a complex group of conditions that require specialized care and ongoing support. While there is often no cure, advances in research and medical treatments continue to improve the outlook for affected children. Awareness, advocacy, and access to comprehensive care are essential in order to support children with such disorders (McMillan et al., 2011).

2.1.11 Pediatric arthritis

Pediatric arthritis, also known as juvenile arthritis, is a group of autoimmune and inflammatory conditions that affect children and adolescents. These conditions cause chronic joint pain, stiffness, and swelling, impacting a child's physical development, mobility, and overall well-being (Habibi et al., 2011).

The exact cause of juvenile arthritis remains unclear, but it is believed to result from a combination of genetic and environmental factors. In this disease, the immune system mistakenly attacks healthy joint tissues, leading to inflammation and joint damage. Some potential triggers or factors contributing to the disease onset include genetics, infections, and abnormalities in the immune system (Habibi et al., 2011).

Pediatric arthritis is an umbrella term that includes several different types, each with distinct characteristics. The most common types of the disease include (Habibi et al., 2011; Prakken et al., 2011; Southwood et al., 1989):

1. Juvenile Idiopathic Arthritis (JIA): This is the most common form of JA, and it encompasses several subtypes, including oligoarthritis (affecting a few joints), polyarthritis (affecting multiple joints), and systemic JIA (involving systemic symptoms like fever and rash).
2. Enthesitis-Related Arthritis (ERA): This subtype primarily affects the entheses, which are the areas where tendons or ligaments attach to bones. It often involves the lower extremities.

3. Juvenile Psoriatic Arthritis: This type of JA is associated with psoriasis, a skin condition characterized by red, scaly patches.
4. Systemic-Onset JIA: This subtype involves systemic symptoms such as high fever, rash, and inflammation in internal organs.
5. Juvenile Lupus: Similar to systemic lupus erythematosus (SLE) in adults, juvenile lupus can affect the joints, skin, kidneys, and other organs.

The symptoms of juvenile arthritis can vary widely, but common signs include joint pain, swelling, stiffness, limited range of motion, fatigue, and changes in appetite or growth patterns. Diagnosis involves a thorough medical evaluation, including a physical examination, blood tests to check for inflammation and autoimmune markers, imaging studies (such as X-rays or ultrasounds), and, in some cases, joint fluid analysis. Diagnosis can be challenging, as symptoms may mimic other conditions or vary over time (Abramowicz et al., 2016).

While there is no cure for juvenile arthritis, a variety of treatment options are available to help manage symptoms and improve a child's quality of life. Treatment approaches may include (Abramowicz et al., 2016):

- Medications: Non-steroidal anti-inflammatory drugs (NSAIDs), disease-modifying antirheumatic drugs (DMARDs), and biologics can help reduce inflammation and manage pain.
- Physical and Occupational Therapy: These therapies help maintain joint function, mobility, and independence.
- Exercise and Activities: Encouraging physical activity is essential to prevent joint stiffness and muscle weakness.
- Nutrition and Growth Monitoring: Proper nutrition and monitoring of growth are important, as some children with JA may experience delayed growth.
- Supportive Devices: Assistive devices such as splints, braces, or mobility aids can help with joint support and mobility.

- Psychosocial Support: Living with a chronic condition can be emotionally challenging, and psychological support can be invaluable for children and their families.

Juvenile arthritis poses unique challenges for affected children and their families. Children may require ongoing medical care, therapies, and modifications to their daily routines. Coping with the emotional aspects of pediatric arthritis, such as pain, fatigue, and limitations, can be particularly challenging for children and adolescents. However, with proper care, education, and a supportive network of healthcare professionals, families, and schools, children with the disease can lead fulfilling lives, pursue education, engage in extracurricular activities, and build meaningful relationships (Duffy, 2005).

In conclusion, pediatric arthritis is a complex and chronic condition that requires early diagnosis, comprehensive care, and ongoing support. Advances in research and treatment options have improved outcomes for children with pediatric arthritis, offering hope for a brighter future. Increased awareness, advocacy, and access to specialized care are crucial in ensuring that children with juvenile arthritis receive the support they need to thrive and reach their full potential (Abramowicz et al., 2016).

2.2 Reasons for using telerehabilitation compared to face-to-face rehabilitation

2.2.1 Accessibility and convenience

Timely intervention is a critical aspect of childhood rehabilitation, and telerehabilitation has emerged as a valuable tool that can provide a distinct advantage compared to traditional in-person rehabilitation in this regard. Here are compelling reasons why telerehabilitation excels in delivering timely intervention for children (Cason, 2009; Cooper et al., 2001; Dostie et al., 2009).

1. Reduced Waiting Times: Traditional rehabilitation services often come with long waiting times for appointments, which can delay the crucial start of therapy for children. Telerehabilitation can significantly reduce these wait times by offering more flexible scheduling options. This ensures that children receive the necessary therapy promptly, preventing further deterioration of their condition or developmental delays.

2. Early Intervention: Early intervention is essential for addressing developmental delays, disabilities, and injuries effectively. Telerehabilitation allows therapists to engage with children at an earlier stage, capitalizing on the critical window of opportunity when interventions are most impactful. Early therapy can help children achieve better outcomes, develop essential skills, and reach their full potential.

3. Immediate Access to Specialists: Telerehabilitation offers the advantage of connecting children with specialized therapists and healthcare professionals without geographical constraints. This immediate access to experts ensures that children receive specialized care and interventions tailored to their unique needs as soon as possible.

In conclusion, the timely intervention provided by telerehabilitation is a game-changer in childhood rehabilitation. By reducing waiting times, enabling early intervention, and offering immediate access to specialists and resources, telerehabilitation ensures that children receive the care they need precisely when they need it. This not only accelerates their progress but also enhances their overall well-being and quality of life (Cason, 2009; Cooper et al., 2001; Dostie et al., 2009).

2.2.2 Family involvement

Family involvement is a cornerstone of effective childhood rehabilitation, and telerehabilitation offers a distinct advantage compared to traditional in-person rehabilitation when it comes to engaging families in the therapy process. The main reasons why telerehabilitation enhances family involvement and support are (Gregory et al., 2022; Ogourtsova et al., 2023):

1. Accessibility and Convenience for Families: Telerehabilitation eliminates the need for families to travel to healthcare facilities, making therapy sessions more accessible

and convenient. This increased accessibility encourages greater family participation as sessions can take place in the comfort of the family's home.

2. Active Participation: Telerehabilitation encourages active participation from parents, caregivers, and siblings during therapy sessions. Therapists can guide family members through exercises, techniques, and interventions, enabling them to play a more significant role in the child's rehabilitation journey.

3. Skill Acquisition and Training: Through telerehabilitation, parents and caregivers can acquire valuable skills and knowledge about their child's condition and therapy techniques. They can learn how to assist their child effectively between therapy sessions, providing continuity of care and reinforcement of therapy goals.

4. Real-Time Feedback and Coaching: Telerehabilitation platforms facilitate real-time feedback and coaching. Therapists can observe family members as they interact with the child, offering guidance and corrections as needed. This immediate feedback enhances the quality of care and ensures that techniques are correctly applied.

5. Collaborative Approach: Telerehabilitation fosters a collaborative approach to therapy. Therapists, parents, and caregivers can work closely together to set goals, track progress, and make adjustments to the treatment plan. This collaborative effort ensures that everyone is aligned in their approach to the child's care.

6. Increased Involvement of Extended Family: Telerehabilitation can also involve extended family members who may not be able to attend in-person sessions due to geographical constraints. Grandparents, aunts, uncles, and other family members can participate remotely, providing additional support and resources.

7. Emotional Support: Families often play a significant role in providing emotional support to the child. Through telerehabilitation, family members can be present during therapy sessions, offering comfort and encouragement to the child, which can be particularly valuable during challenging or strenuous exercises.

8. Consistency of Care: With family members actively participating in therapy sessions, the child can receive consistent care at home between scheduled sessions. This continuity of care ensures that therapeutic strategies are consistently reinforced, promoting better outcomes.

9. Increased Understanding: Telerehabilitation promotes a deeper understanding of the child's condition and therapy goals among family members. This understanding can lead to more informed decision-making regarding the child's care and lifestyle adjustments.

10. Empowerment: Telerehabilitation empowers families to take an active role in their child's rehabilitation journey. This empowerment can boost their confidence in managing the child's condition and contribute to a sense of control and agency.

In conclusion, telerehabilitation's capacity to enhance family involvement is a significant advantage in childhood rehabilitation. By increasing accessibility, promoting active participation, and facilitating collaboration between therapists and families, telerehabilitation ensures that families are integral partners in the child's therapy process. This collaborative effort not only improves the child's outcomes but also strengthens the support network around them, fostering a holistic and family-centered approach to care (Ogourtsova et al., 2023).

2.2.3 Individualization

Telerehabilitation in childhood offers a distinct advantage over traditional in-person rehabilitation due to its remarkable ability to customize and individualize therapy plans. This personalized approach is crucial in addressing the unique needs and goals of each child. Telerehabilitation platforms provide therapists with the flexibility to create highly individualized treatment plans for each child. These plans can be fine-tuned to address specific conditions, goals, and developmental stages, ensuring that therapy is precisely aligned with the child's needs (Nuara et al., 2022).

The customization process in telerehabilitation starts by setting clear and measurable goals based on the child's condition and functional abilities. Therapists work closely with families to identify these goals, allowing therapy to focus on achieving specific outcomes. Telerehabilitation offers a wide array of modalities and tools to suit individual preferences and requirements. Therapists can adapt the use of technology, exercises, interactive games, and strategies that resonate most with the child, making therapy engaging and effective. They can also adjust the duration,

frequency, and content of sessions as needed, ensuring that therapy fits into the child's schedule and comfort level (Lightfoot et al., 2014; Nuara et al., 2022).

Regarding the assessment of outcomes, telerehabilitation allows therapists to conduct remote assessments, which can help identify the child's strengths and areas that require further attention. These assessments contribute to the development of personalized interventions. The individualized assessment can also highlight multiple coexisting conditions or comorbidities that require specialized care. Telerehabilitation allows for the seamless integration of various therapies to address these complex needs effectively (Hailey et al., 2011).

Finally, telerehabilitation can accommodate children from diverse cultural and linguistic backgrounds. Therapists can adapt their approach to respect cultural preferences and language barriers, ensuring that therapy is inclusive and effective. This option leads to the maximum respect for each child’s preferences, according to its cultural background (Gombatto et al., 2023).

In conclusion, the customization and individualization offered by telerehabilitation in childhood are pivotal in delivering effective rehabilitation services. By tailoring treatment plans, setting specific goals, offering diverse modalities, and adapting therapy to each child's needs and circumstances, telerehabilitation ensures that therapy is not only more efficient but also more enjoyable and relevant for the child. This personalized approach maximizes the potential for progress and contributes to improved outcomes and a higher quality of life for children in need of rehabilitation (Hailey et al., 2011; Nuara et al., 2022).

2.2.4 Adjustment to the family and home environment

Telerehabilitation offers a significant advantage over traditional in-person rehabilitation in childhood by providing therapy in the comfort of a familiar environment, typically the child's home. This comfort and familiarity contribute to a more positive and effective rehabilitation experience. Children, especially those with medical conditions or disabilities, may experience anxiety and stress in clinical settings. The home environment is familiar, comforting, and less intimidating, helping to reduce

the child's anxiety during therapy sessions. A comfortable and familiar setting promotes better engagement during therapy. Children are more likely to actively participate in exercises and activities when they feel at ease, leading to more productive sessions. Further, children are more likely to comply with therapy recommendations when therapy occurs at home. This compliance can be particularly important for long-term or repetitive therapies, as the child is in a space where they feel safe and supported (Ogourtsova et al., 2023).

Regarding the impact of such family-oriented telerehabilitation sessions, they could lead to skills and techniques learned in the home environment that are more likely to be transferable to daily life activities. This generalization is crucial for children to apply what they learn in therapy to their everyday routines effectively. This effect could be attributed to the fact that telerehabilitation allows therapists to adapt therapy sessions to the specific needs of the child's home environment, through cooperation with the parents, maximizing its impact (Ogourtsova et al., 2023).

In fact, the home environment could be extremely useful to design and deliver rehabilitation interventions. A major reason is the reduced sensory overload of the home and family environment. Some children with sensory sensitivities may find clinical environments overwhelming due to unfamiliar sights, sounds, and smells. Home-based telerehabilitation minimizes sensory overload, creating a more comfortable and conducive atmosphere for therapy. Further, children often have access to their familiar toys, equipment, and resources at home, which can be integrated into therapy sessions. This familiarity can make therapy more engaging and enjoyable for the child and lead to better outcomes (Ogourtsova et al., 2023).

In conclusion, the comfort and familiar environment offered by telerehabilitation play a vital role in optimizing the effectiveness of childhood rehabilitation. By reducing anxiety, enhancing engagement, and facilitating family involvement, telerehabilitation not only creates a more positive therapy experience but also helps children apply the skills and techniques learned in therapy to their daily lives more effectively. This holistic approach contributes to better outcomes and an improved quality of life for children in need of rehabilitation services (Ogourtsova et al., 2023).

2.2.5 Implementing telerehabilitation during the pandemic

Telerehabilitation has demonstrated itself as a valuable and advantageous alternative to traditional in-person rehabilitation, especially in the context of the COVID-19 era. The pandemic has necessitated innovative approaches to healthcare, and telerehabilitation has emerged as a solution with numerous benefits for childhood rehabilitation. The foremost advantage of telerehabilitation during the COVID-19 era is the minimization of in-person contact. In healthcare settings, especially rehabilitation facilities where children may have underlying health conditions, reducing the risk of exposure to the virus is paramount (Prabawa et al., 2021). Telerehabilitation allows for continued care while ensuring the safety of both patients and healthcare providers. In addition, the pandemic disrupted healthcare services, causing interruptions in treatment for many children. Telerehabilitation bridges this gap by providing a means to continue therapy without interruptions. This continuity is

vital for children with chronic conditions or those requiring ongoing rehabilitation (Brigo et al., 2022). Thus, telerehabilitation has an advantage due to minimization of in-person contact and continuity of care.

COVID-19 has made access to healthcare services more challenging due to lockdowns, restrictions, and limited clinic capacities. Telerehabilitation offers a timely intervention, reducing waiting times for appointments and ensuring that children receive the therapy they need promptly (Schwab & Malleret, 2020). In fact, delaying the necessary appointments and missing medical appointments were regarded as a major threat for children with chronic diseases during the pandemic (Pelekasis, 2021). Hence, telerehabilitation overcomes the barriers to treatment, leading to a significant improvement of children physical health.

Moreover, the pandemic had a negative impact on the mental health of children and their families. Telerehabilitation provides a platform for therapists to address not only physical but also emotional and psychological needs, helping children cope with stress and anxiety (Ganapathy, 2021).

In conclusion, telerehabilitation has emerged as a versatile and essential tool in childhood rehabilitation during the COVID-19 era. Its ability to ensure safety, maintain continuity of care, offer timely interventions, and provide flexibility aligns perfectly with the challenges presented by the pandemic. In that context, telerehabilitation could be an essential tool in case of relevant threats in the future (Schwab & Malleret, 2020).

2.2.6 Data tracking and analysis

Telerehabilitation presents a notable advantage over traditional in-person rehabilitation in childhood due to its advanced capabilities for data tracking and analytics. These features not only enhance the quality of care but also contribute to better outcomes and a more informed approach to pediatric rehabilitation. Telerehabilitation platforms often include assessment tools that provide objective data on a child's progress. These assessments are critical for therapists to evaluate the effectiveness of interventions and adjust treatment plans accordingly. It also enables continuous monitoring of a child's performance and progress. This real-time data collection allows therapists to identify trends, track improvements, and make data-driven decisions promptly. Data tracking provides quantitative measurements of a child's functional abilities, range of motion, strength, and other relevant parameters. This objective data helps therapists gauge the effectiveness of therapy and set realistic goals (Prvu Bettger & Resnik, 2020).

With access to comprehensive data, therapists can set specific, measurable, achievable, relevant, and time-bound goals for each child. These goals provide clear benchmarks for progress and motivation for both the child and their family. Data analytics enable therapists to personalize interventions based on each child's unique needs and progress. Therapists can fine-tune therapy plans to address specific challenges or modify exercises as required. Through data tracking, therapists can identify potential issues or plateaus in a child's progress early. This proactive approach allows for timely adjustments to therapy strategies to prevent setbacks or stagnation (Nikolaev & Nikolaev, 2022).

In conclusion, the ability for data tracking and analytics in telerehabilitation is significant for the effectiveness of childhood rehabilitation. It offers therapists, children, and their families valuable insights into progress, facilitates evidence-based

decision-making, and allows for personalized interventions. This data-driven approach not only enhances the quality of care but also empowers children to achieve their rehabilitation goals effectively and efficiently (Prvu Bettger & Resnik, 2020).

2.2.7 Cost-effective considerations

Telerehabilitation offers a compelling advantage over traditional in-person rehabilitation in childhood by being a cost-effective alternative that maximizes the value of healthcare resources. One of the most immediate cost-saving benefits of telerehabilitation is the elimination of travel expenses. Families often incur costs related to transportation, parking, and accommodation when attending in-person therapy sessions. Telerehabilitation allows families to access therapy services from the comfort of their homes, minimizing these expenditures. Time is also a valuable resource, especially for parents and caregivers of children with healthcare needs. Telerehabilitation eliminates the need for time-consuming commutes to healthcare facilities, saving families valuable hours that can be redirected to other responsibilities and activities. Hence, telerehabilitation leads to reduced cost of time and money (McCue et al., 2010).

In addition, traditional rehabilitation services typically involve overhead costs associated with maintaining physical healthcare facilities. Telerehabilitation reduces the demand for these facilities, potentially allowing healthcare systems to allocate resources more efficiently. Transportation challenges, work schedules, and other logistical barriers can lead to missed appointments in traditional rehabilitation. Telerehabilitation minimizes these obstacles, resulting in a higher rate of attendance and more productive therapy sessions. Furthermore, telerehabilitation contributes to cost savings within healthcare systems by reducing the strain on physical infrastructure, such as clinics and hospitals. It allows healthcare systems to reallocate resources to areas where they are most needed (McCue et al., 2010).

In conclusion, telerehabilitation's cost-effectiveness makes it a highly attractive option for childhood rehabilitation. By reducing travel costs, improving resource allocation, and increasing the efficiency of therapy delivery, telerehabilitation benefits not only families but also healthcare systems and society at large. In general, it

represents a sustainable and economically viable approach to providing quality rehabilitation services to children in need (McCue et al., 2010).

2.2.8 Interdisciplinary collaboration

Telerehabilitation in childhood offers a significant advantage over traditional in-person rehabilitation by fostering enhanced multi-disciplinary collaboration among healthcare professionals. This collaborative approach leverages the expertise of various specialists to provide comprehensive care for children with complex needs. Telerehabilitation allows children to access a broader range of specialists and therapists, regardless of their geographical location. This includes physical therapists, occupational therapists, speech therapists, psychologists, behavioral therapists, and more. Each specialist can contribute their expertise to the child's care plan. Telehealth platforms facilitate seamless communication and information sharing among members of the healthcare team. Therapists, physicians, nurses, and other professionals can collaborate effectively in real time, regardless of their physical location (Tran et al., 2017).

In complex cases, timely consultations with multiple specialists are crucial. Telerehabilitation enables quick and efficient multi-disciplinary consultations, reducing delays in diagnosis and treatment planning. In addition, telerehabilitation platforms often include features for care coordination. This ensures that all healthcare professionals involved in a child's care are aligned in their approach, resulting in a consistent and coordinated care plan (Tran et al., 2017).

The most vital contribution of interdisciplinary teams has to do with children affected by rare diseases. For children with rare medical conditions, accessing specialists with specific expertise can be challenging. Telerehabilitation breaks down geographical barriers, ensuring that children can receive specialized care and therapy regardless of their location. Hence, it is possible to make a positive impact on the health of children who have high supportive care needs and limited access to the essential health professionals (Scherr et al., 2021).

In conclusion, telerehabilitation's ability to facilitate multi-disciplinary collaboration is a significant advantage in childhood rehabilitation. It ensures that children receive the collective expertise of various healthcare professionals, leading to comprehensive and individualized care plans. This collaborative approach enhances the quality of care, accelerates progress, and improves the overall well-being and outcomes of children in need of rehabilitation services (Scherr et al., 2021; Tran et al., 2017).

2.2.9 Enhanced language and communication support

Telerehabilitation in childhood offers a notable advantage over traditional in-person rehabilitation by providing enhanced language and communication support. This advantage is especially crucial for children with speech and language disorders or those who require assistance in their communication skills. Telerehabilitation makes it easier for children to access the expertise of speech-language pathologists, regardless of their geographical location. This is particularly valuable in areas with a shortage of those pathologies or for families who may have difficulty traveling to in-person sessions (Brennan et al., 2002).

Telerehabilitation offers several chances for enhanced language and communication support because it provides more communication options compared to traditional rehabilitation. Children who use augmentative and alternative communication devices can benefit from telerehabilitation. Speech language pathologists can provide guidance on using augmentative and alternative communication devices effectively and help children develop their communication skills using these tools (Hill, 2010).

Telerehabilitation platforms can also include visual aids and interactive tools that assist speech language pathologists in teaching language and communication skills. These tools make therapy engaging and visually stimulating for children, enhancing their learning experience (Fiani et al., 2020).

Another feature of these platforms is their support for multilingual and bilingual children. Telerehabilitation can accommodate children from diverse linguistic backgrounds. Speech language pathologists can provide support in multiple languages, making therapy accessible and effective for multilingual and bilingual children (Giesbrecht et al., 2023).

In conclusion, telerehabilitation's capacity to provide language and communication support is a significant advantage in childhood rehabilitation. By offering access to specialized speech language pathologists, individualized therapy, interactive tools, and guidance for parents and caregivers, telerehabilitation empowers children with speech and language challenges to improve their communication skills effectively. This support not only enhances their ability to express themselves but also boosts their confidence and overall quality of life (Fiani et al., 2020; Hill, 2010).

CHAPTER 3: METHODS

3.1 Study design

This study is a systematic literature review. In terms of methodology, systematic reviews are suitable for answering well-formulated research questions (Ryś et al., 2009). As the present study focused on investigating the potential difference of telerehabilitation versus traditional rehabilitation, this approach was considered as consistent with the overall objective of the research.

Research in Health Sciences has led to many new insights into disease prevention and care for people with health problems. As the volume of research has grown, so has the need for rigorous formulations of the best available data (Rys et al., 2009).

Bibliographic reviews have been used for centuries. They often make use of published literature - in general, published papers cited in a literature review have been subjected to the process of blind peer review (a hallmark of most scientific journals). The papers included in those types of studies may include research reports presenting data, as well as conceptual or theoretical literature focusing on a specific subject (Rys et al., 2009).

There are several reasons leading an author to conduct a literature review, such as the following (Rys et al., 2009):

* present general knowledge on a subject

* present the history of Knowledge Development on a subject

* identify where data may be incomplete, contradictory or unclear

* determine whether there is a scientific agreement or discussion on a subject

* identifies features or relationships between key concepts from existing papers related to the subject

* explains the reason for which a problem deserves additional research

The aforementioned aims are well served by a "traditional" or "narrative" review of the literature. Such reviews, though useful, have significant negatives in terms of informed decision-making in nursing. Primarily subjective, they are based on the author's knowledge and experience and provide a limited rather than exhaustive presentation of a topic (Eger et al., 2012). These type of papers are usually based on reports selected exclusively from available evidence, leading to a review inherently posing the risk of bias or systematic error. Traditional literature studies are helpful to describe a topic and the ideas and theories underlying it, but if conducted according to no set methodology, it is hard to replicate the results - leaving findings and conclusions to rely heavily on authors' perspectives (Krainovich-Miller, 2006). In several occasions, the author of the review paper only discusses the main concept or outcomes from the papers used, rather than analyzing the findings of each separate study.

Nurses and other clinicians must report and be based on research evidence to inform decision-making under so-called “evidence-based medicine.” The need for documentation of clinical practice is constantly growing due to developments that are constantly expanding the treatment available to patients. Nurses and physicians frequently have to decide which strategies to implement, however comparisons between available options can be difficult to find due to limited information and time, especially among clinical staff. Moreover, interpreting scientific findings as presented in related publications is not easy. By not having clear recommendations for practice, it can be hard to use evidence appropriately and, in some cases, extensive knowledge or experience of the way to apply evidence in the clinical practice (Ubbink et al., 2013).

As a result of the research, the knowledge on which healthcare is based has evolved rapidly. This breakthrough means nurses can access biomedical databases containing numerous health care-related report. That type of databases are growing at an unprecedented rate, with tens of thousands of publications further included each year. The volume of literature is now too large for nurses and other healthcare professionals to attend to. In addition, not all published research is trustworthy. Contrarily, many published papers have applied improper statistical analyses or have otherwise been conducted inadequately (Averis & Pearson, 2003).

Such issues that affect the quality of research may lead to study outcomes that are contradictory or inconclusive. Similarly, using the outcome of an individual study

to make clinical decisions is not indicated. When compared with other research on the subject, a research may be at risk of bias or systematic error. Hence, it can be difficult for nurses to know which papers from the total of available can be used to inform their daily decisions. As a result, literature reviews have evolved into an increasingly important means through which data is collected, evaluated, and finally organized (Pearson et al., 2005; Rys et al., 2009; Tricco et al., 2011).

Since traditional literature studies lack a formal means of estimating the effect of an intervention, including the size and accuracy of the estimation (Eger et al., 2012), a significantly more structured approach is warranted. The "systematic review", known as well as "research synthesis", has as an objective to provide a comprehensive, unbiased synthesis of several relevant studies in a single paper (Eger et al., 2001). While it shares several characteristics with literature papers, adhering to the general principle of summing up knowledge from a set of literature, systematic review differs in that it attempts to uncover the total evidence relevant to a question and emphasize on combining data from divergent sources (Babbie, 2013).

As a scientific endeavor, a systematic review will impact healthcare decisions and has to be conducted with the same rigor expected from any research. An explicit and exhaustive account of the methods used in the composition is also a characteristic feature of any well-conducted systematic review. For systematic reviews, reference standards comparable to those produced for primary research projects have been created. The PRISMA statement or Preferred Reporting Items for Systematic Reviews and Meta-Analyses includes a checklist for review authors on how to report a systematic review (Moher et al., 2009). Finally, the quality of a systematic review and the recommendations resulting from it depend on the degree to which methods are followed to reduce the risk of error and bias. For example, the existence of multiple stages in the systematic review process, including the selection of studies, critical evaluation and the extraction of data conducted in duplicate and by independent reviewers, minimizes the scenario of subjective interpretation, but also of inaccuracies due to random error having an affect on the results of the study. These methods are the main difference between systematic and literature reviews (Rys et al., 2009).

The following are the basic characteristics of a systematic review, which generally differentiate it from a literature review (Rys et al., 2009):

* clearly formulated aim and research question

* inclusion and exclusion criteria, defined in advance through protocols, determining the eligibility of studies

* extensive search to identify all relevant papers, no matter if they are published or they belong the the grey literature

* quality appraisal of the studies, evaluation of their results validity and report of any exclusions based on quality

* data analysis of the information extracted

* presentation and synthesis of the findings extracted

* transparent reporting of the methods used to carry out the study

The way systematic reviews are carried out can vary - the methods applied are related to the question being asked. The Cochrane Collaboration approach is almost exclusively adopted for a clear review of the effect of a treatment. Yet, the specific methods applied to synthesize qualitative evidence in a review study may vary based on the preference of team that carries out the research, among other reasons and parameters (Tricco et al., 2011).

A key issue concerns the way that the review question is defined and the way that the inclusion criteria are set. The ideal aim of systematic reviews is to answer specific questions rather than present general summaries of the literature on a topic of interest (Khan et al., 2003). This type of studies does not aim generate new knowledge, but to synthesize and summarize existing knowledge, and therefore there must already be relevant research on the subject (Aversi & Pearson, 2003). The discussion of the question takes place as a first step in the development of the protocol of the review. Nurses and physicians familiar with evidence-based practice and database searching will be familiar with PICO initials (population, intervention, comparison intervention, and result measures), which helps formulate a query that includes these concepts to help search (Khan et al., 2003).

Ideally, the study protocol is developed prior to the start of the systematic review, a practice which was followed at the present study. It details the eligibility of

the records to be included in the review (based on the PICO) and the methods to be used to carry out the review. Adherence to the eligibility criteria set out in the review protocol ensures that studies selected for inclusion are selected on the basis of their research method, as well as on the PICO data of the study, and not only on the findings of the study (Averis & Pearson, 2003). This was also the case in this study, where criteria were set that did not change subsequently. Conducting the review in this way reduces the potential for bias and reduces the likelihood of changing the focus or boundaries of the review after the results appear. In addition to PICO data, inclusion criteria should identify the research design or types of studies the review aims to find and summarize, such as RCTs when answering a question about the effectiveness of an intervention or treatment (Rys et al., 2009).

The search for related studies can be a complex issue for systematic reviews. The goal is to find as many studies as possible on the topic of interest, and a comprehensive search strategy should be developed and presented to readers (Averis & Pearson, 2003). It is frequent to increase complexity, starting with an initial search of large repositories, such as MEDLINE (accessed via PubMed) and Cumulative Index to Nursing and Allied Health (CINAHL), making a use of keywords that arise from the review query. This preliminary search is helpful to determine the best search terms, including further keywords and thematic headings or indexing terms, which are then used when searching all relevant databases. This was clearly the case for this systematic review, with the aim of managing a large amount of data, which would allow the research question to be answered as fully as possible. Finally, a by hand search is performed in the list of references for all recovered tasks to identify any studies that were omitted during the search of databases (Rys et al., 2009).

Key issues of a systematic review are also the selection of papers and the critical evaluation of them. PICO data can help define the inclusion criteria used to select the studies for the systematic review. The criteria uses to include a study place the review question in a practical context and have a guiding role for the research team, helping the researchers to determine which papers have to be included (Averis & Pearson, 2003). This step is described as study selection. Once the studies to be included have been determined, their quality has to be assessed at the critical evaluation step (Rys et al., 2009).

When selecting studies, the researchers consider matching the studies detected during the search to the inclusion criteria of the review - that is, identify those studies conducted in the correct population, use the interventions of interest, and record the predefined and relevant results (Aversi & Pearson, 2003). The ideal research design in order to answer the question of the review is also determined. For example, for a systematic review evaluating the impact of an intervention, the most reliable evidence comes from randomized trials, which make it possible to draw conclusions about causal associations between the intervention and the outcome, rather than from other study designs, like cohort studies, which lack randomization. Any criteria used to exclude studies - for example, specific populations or ways of providing an intervention-should also be reported.

During the critical evaluation, an original evaluation of all studies to be included takes place, to assess their methodological excellence. Even though there are some subtle divergencies, this assessment resembles evaluating the risk of bias in reviews that raise questions regarding the impact of interventions. A systematic review has as a primary aim to synthesize the best evidence to make clinical decisions. Assessing the validity of a research requires making careful considerations for the methods applied during the investigation and determining whether the research can be trusted to provide a reliable and accurate description of the intervention and its outcomes (Rys et al., 2009). Papers that are of low or questionable quality are generally excluded from the rest of the process, although this is not necessary and was not followed in this case, as it may lead to a very low number of studies to study attitudes towards self-managed learning. Excluding lower quality studies minimizes the risk of error and bias in the results of the review (Averis & Pearson, 2003).

With regard to the extraction and synthesis of data, once the quality of the research has been established, the related data in line with the predefined results of the review for the so important synthesis of the findings should be extracted. The data composed by this type of studies are the results extracted from individual research studies - as in critical evaluation, data extraction is frequently facilitated by the use of a tool or instrument that ensures that the most relevant and accurate data is collected and recorded (Averis & Pearson, 2003). A tool may prompt the assessor to extract relevant referral data, details of the participants of a study, including their number and eligibility, descriptive data of the intervention and comparative factor used in the study,

and meaningful results data. The information collected from the independent papers vary in each review, but should always answer the question posed by the review (Rys et al., 2009).

The composition of the data is a main characteristic of the systematic review. There are several methods that are applied, depending on the type of data extracted, and it is the most appropriate for the review query (Tricco et al., 2011). In dependence to the question posed, such a synthesis of the results of the relevant studies also allows investigation of the similarities or inconsistencies of the treatment effect in different studies and between various contexts and patient groups (Rys et al., 2009). In case of different results between similar studies, they can be analyzed further. The synthesis can provide a narrative summary of the papers that were included, or, if possible, statistically combines the data extracted from the independent papers. This concentration of data is called "meta-analysis" (Rys et al., 2009) and was not followed in this particular case.

This type of analysis can be included in a systematic review to evaluate many studies. Meta-analysis have ideally to be performed only in the case that the studies and the populations of the studies are quite similar. Studies should have similar goals and purposes, deliver similar interventions, and (most importantly) evaluate the same outcomes (Averis & Pearson, 2003). Given the expected heterogeneity of the studies in this review, which included different types of patients and interventions, it was decided when designing the study that the data should not be meta-analyzed.

3.2 Search process

The search process was carried out in Pubmed and Scopus. The search was filtered by the period from 01.01.2013 onwards and the language of publication was English. As keywords the combination telerehabilitation AND (child* OR kids OR students) AND (cognitive OR memory OR attention OR processing OR language OR perception OR "executive function" OR "processing speed" OR "spatial awareness" OR reasoning OR "problem solving" OR "decision making" OR "verbal comprehension" OR metacognition) was be used. The data from both databases were imported into Zotero software, which is a free software that helps to conduct systematic reviews and meta-

analyses (Ahmed & Al Dhubaib, 2011). In addition, studies identified in additional ways during the search process (e.g. studies included in the list of literature references of relevant articles) were imported. Subsequently, duplicate studies from the archive that was formed were be removed so that each title would be present in the archive only once. Subsequently, a first reading of the study titles was performed, and those studies that are obviously inappropriate for inclusion in the review were excluded from the title. The remaining studies were then examined for the suitability of their full text for inclusion in the review. For each study that did not meet the criteria, the reason for exclusion was recorded in detail. Finally, only those studies that met the criteria remained in the relevant archive and were further analysed.

3.3 Inclusion and exclusion criteria

Inclusion criteria:

a) a research published in peer-reviewed journals

(b) a study examining telerehabilitation and traditional rehabilitation

(c) a sample of children with any problem at the level of cognitive functioning

(d) a study of cognitive functioning as a dependent variable

(e) research design of a randomised clinical trial

Exclusion criteria:

(a) unavailability of full articles

(b) studies in a language other than English

Data to be extracted

The data that were exported were the year of the study, country, number of participants, sample characteristics, measurements, type of intervention, follow-up period and results.

Information flow

The information flow of the study were be based on the PRISMA Statement (Moher et al, 2009).

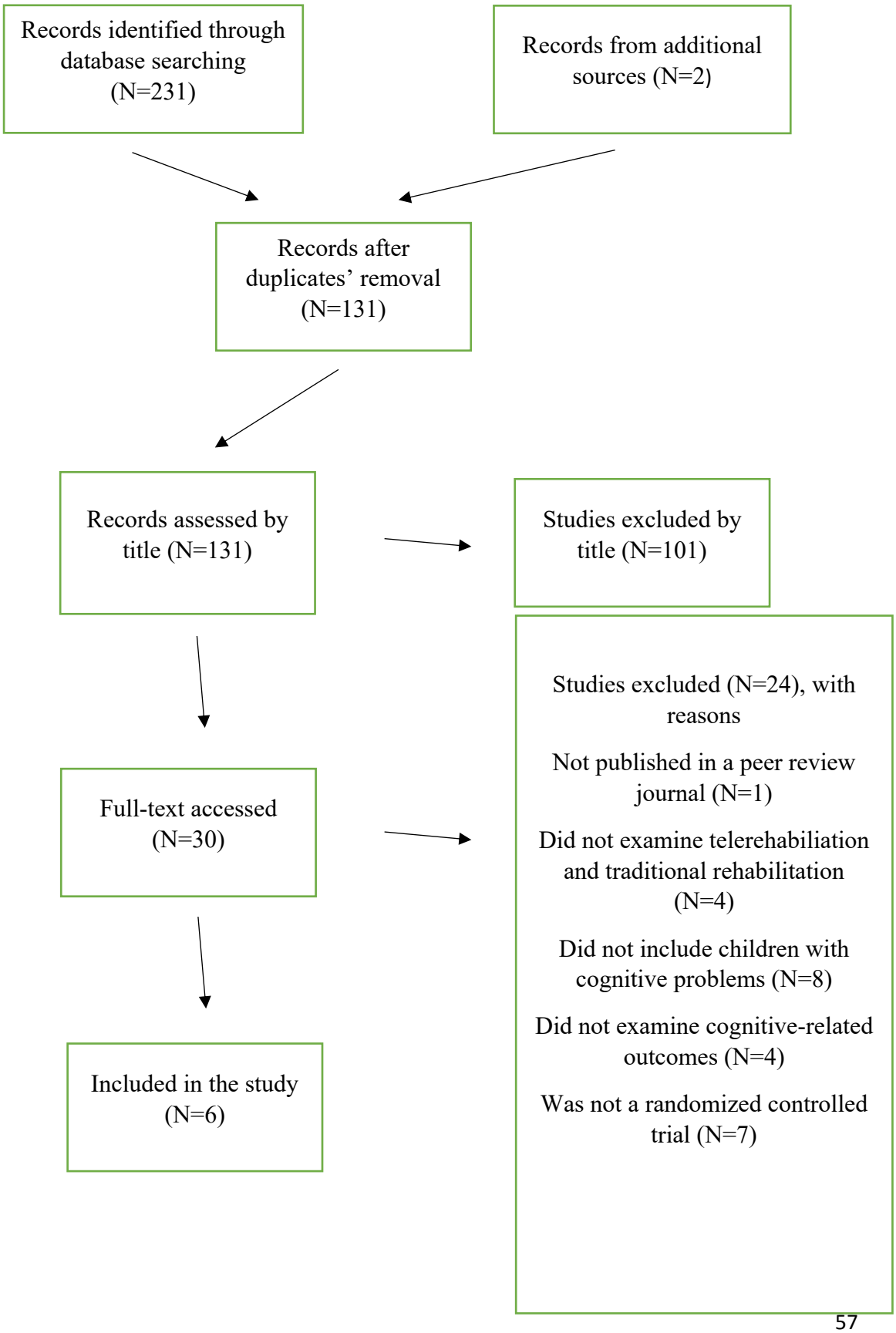
3.4 Quality appraisal

The assessment of the methodological reliability of the studies were carried out using the Jadad Scale (Jadad Scale). This scale is a tool applied in order to evaluate the quality of clinical studies. The Jadad Scale assesses three main aspects of clinical trials: randomization, blinding and description of loss to follow-up. Each aspect is assessed against specific criteria and a score is assigned according to the information provided in the study. The scores for each aspect are then summarized to produce an overall score for the study (0-5) (Jadad et al., 1996).

CHAPTER 4: RESULTS

The flow of information from record identification till study inclusion is presented at Table 1. As indicated by the table, a total of 231 studies were identified through database searching. Two other records were found through snowball. A total of 131 records remained after duplicates removal and were assessed by title. From those studies, 101 were excluded by title, since they were obviously inappropriate. Twenty-four studies did not meet the inclusion and exclusion criteria and, therefore, 6 studies were finally included in the systematic review.

Diagram 1. The flow of information



The first paper included was the study carried out by Baque et al. (2017). The objective of this paper was to compare the effects of the web-based multimodal training programme, 'Move it to improve it' (MitiiTM), to standard care on gross motor capacity and performance for children affected by acquired brain injury. The design of the study was a randomized waitlist controlled trial, applied at the children's home. A total of 60 independently ambulant children (half of them in each group), minimum 12 months after acquired brain injury were recruited and randomly allocated to receive either 20 weeks of MitiiTM training (30 minutes/day, six days/week, total 60 hours) immediately, or waitlisted (usual care control group) for 20 weeks. A total of 58 children had complete baseline assessments (32 boys; age 11 years 11 months ± 2 years 6 months; Gross Motor Function Classification System equivalent I = 29, II = 29). The primary outcome of the study was 30-second, repetition maximum functional strength tests for the lower limb (sit-to-stand, step-ups, half-kneel to stand). Secondary outcomes were also evaluated, which were the 6-minute walk test, High-level Mobility Assessment Tool, Timed Up and Go Test and habitual physical activity, as measured though the use of a four-day accelerometry. At first, baseline analysis was performed. As indicated by the analysis, the intervention and the control group were equivalent at baseline on demographic and clinical measures. The intervention group had significantly higher improvement on combined score of functional strength tests (mean difference 10.19 repetitions; 95% confidence interval, 3.26-17.11; $p = 0.006$) in comparison to the control group. No other significant differences were noted between the intervention and the control group. Hence, the MitiiTM programme lead to significant benefits in the functional strength tests of the lower limb (Baque et al., 2017).

A second relevant study was carried out by Barkin et al. (2023) in Turkey. Virtual reality and game-based interventions is possible to have a positive impact on children affected by ADHD. This research aimed to examine the impact of a Self-oriented game based program (SGBP) and Therapist Guided Game-based Intervention Program (TGGIP) ADHD children motor skills. The design of the research was a single-blind, randomized, controlled trial. A total of 176 children with ADHD took part in the trial and were randomly allocated into the two groups of the study. Based on the within-group comparisons of pre-and post-intervention Bruininks-Oseretsky test scores, there were significant increases in all sub-scores and the total score ($p < 0.05$).

Significantly higher scores were noted in the TGGIP group. This intervention was more effective in comparison to SGBP in improving ADHD children motor skills. The TGGIP intervention the study authors developed acts beneficially in order to make use of accessible games for structured and supervised virtual reality and game-based rehabilitation.

A third study was the one carried out by Dursun et al. (2023), which was also carried out in Turkey. The aim of the specific interventional study was to investigate the efficacy of a 5-week, telecoaching intervention in children affected by organic acidemia. A total of 34 children were randomly allocated into the two groups of the study, the intervention and control group. Half of the study participants were allocated to the intervention and half to the control group. The telehealth intervention was carried out twice a week along with the standard home-rehabilitation, which was delivered both to the intervention and the control group. Children were assessed through the Canadian Occupational Performance Measure, Pediatric Evaluation of Disability Inventory, Child and Adolescent Scale of Participation, Kid-KINDL Questionnaire, and Assistance to Participate Scale. Between-group analyses indicated significant benefits ($p < .05$) for the CO-OP group in comparison to the control group on the Performance and Satisfaction scales of the Canadian Occupational Performance Measure, and on the total scores of the Pediatric Evaluation of Disability Inventory, Child and Adolescent Scale of Participation, KINDL, and the Assistance to Participate Scale. The study results indicate the positive impact of telerehabilitation on children affected by organic acidemia.

A fourth study was carried out by Piovesana et al. (2017a) in Australia. The aim of this study was to determine the efficacy of Move-it-to-improve-it on children with unilateral cerebral palsy, specifically on patients' executive function. In total, 102 children were allocated to a matched intervention and waitlist control group. Executive function capacity was evaluated by attentional control (DSB; WISC-IV), cognitive flexibility (inhibition and number-letter sequencing DKEFS), goal setting (D-KEFs Tower Test) and information processing (WISC-IV Symbol Search and Coding). Executive Function performance was evaluated via parent report. Groups were compared after receiving the intervention of 20 weeks. There were no significant differences between the two groups in attentional control (DSB; $p = 0.20$;CI= -0.40,1.87), cognitive flexibility (Inhibition, $p = 0.34$; CI= -0.73,2.11; number/letter

sequencing, p = 0.17; CI= -0.55,2.94), problem solving (Tower; p = 0.28; CI= -0.61,2.09), information processing (Symbol; p = 0.08; CI= -0.16, 2.75; Coding; p = 0.07; CI= -0.12,2.52) or executive function performance (p = 0.13; CI= -10.04,1.38).

A fifth study was carried out by Pionesava et al. (2017b), the research group which also carried out the aforementioned trial. The aim of this paper was to investigate the impact of their multi-modal web-based therapy program to improve Executive Functioning in children with an acquired brain injury. This study was a randomised waitlist controlled trial, delivered at home. Sixty children meeting the inclusion criteria were matched in pairs by age and intelligence quotient and then randomised to either 20-weeks of the intervention or 20 weeks of the standard treatment (waitlist control; n=30; 17 males; mean age=11y, 11m (±2y, 6m); Full Scale IQ=76.24±17.84). Fifty-eight children were administrated the baseline assessments (32 males; mean age=11.87±2.47; Full Scale IQ=75.21±16.76). Executive functioning evaluated on four domains: attentional control, cognitive flexibility, goal setting, and information processing using subtests from the Wechsler Intelligence Scale for Children (WISC-IV), Delis-Kaplan Executive Functioning System (D-KEFS), Comprehensive Trail Making Test (CTMT), Tower of London (TOL), and Test of Everyday Attention for Children (Tea-Ch). Executive functioning performance in everyday life was evaluated through parent questionnaire (Behaviour Rating Inventory of Executive Functioning; BRIEF). No significant differences were noted between the two groups in any of parameters that were assessed.

The sixth study of the present systematic review was carried out by Szturm et al. (2022) in Canada. The aim of this exploratory randomized controlled trial was to investigate the feasibility and impact of a novel game-based dual-task balance exercise intervention in children affected by cerebral palsy. Twenty children affected by the disease were randomly allocated in a standard care and an intervention group, which received a game-based dual-task balance exercise program. Both groups received their respective therapy programs for 12 weeks, receiving 3 sessions every week. The parents and children were assessed through semi-structured interviews and qualitative analysis were utilized in order to assess the children's experiences with the game-based exercise program. The assessments administrated to the participants were the following (a) the Pediatric Balance Scale (PBS), (b) Gross Motor Function Measure-88 (GMFM-88), and (c) computerized measures of standing balance performance in various dual-task

conditions. The compliance rate of all participants was 100%. The participants of the intervention group a higher improvement in PBS, GMFM, and DT balance measures in comparison to the participants of the control group. The results indicate that this telerehabilitation intervention had a significant compliance rate and related benefits for the patients.

Table 1. The extracted data of the studies						
Study	Country	Characteristics of the sample	Measurements	Type of intervention	Follow-up period	Results
Baquet et al., 2017	Australia	60 children with acquired brain injury	The main outcome was 30-second, repetition maximum functional strength tests for the lower limb (sit-to-stand, step-ups, half-kneel to stand). Supplementary outcomes were the 6-minute walk test, High-level Mobility Assessment Tool, Timed Up and Go Test and habitual	The intervention group received Move-it-to-improve-it, a multi-modal web-based program that aims to improve executive function. It was delivered 6 times per week in 30 minutes sessions	20 weeks	Greater improvements of functional strength tests in the intervention compared to the control group

			physical activity as captured by four-day accelerometry			
Barkin et al., 2023	Turkey	176 children with ADHD	Motor skills	Self-oriented game based program and Therapist Guided Game-based Intervention Program, received by two different study groups	8 weeks	Significant improvement for both groups post-interventions. Significantly higher improvement for the Therapist Guided Game-based Intervention
Dursun et al., 2023	Turkey	34 children with organic acidemia	Canadian Occupational Performance Measure, Pediatric Evaluation of	Telerehabilitation-based coaching for the intervention group participants, twice per	5 weeks	There were significant differences in favor of the intervention group

			Disability Inventory, Child and Adolescent Scale of Participation, Kid-KINDL Questionnaire, and Assistance to Participate Scale	week. The intervention and control group participants continued their standard treatment during the study		in all the assessments
Piovesana et al., 2017a	Australia	102 children with unilateral cerebral palsy	Executive function capacity, assessed through attentional control scale of the WISC-IV, cognitive flexibility through the inhibition and number-letter sequencing DKEFS, goal setting	The intervention group received Move-it-to-improve-it, a multi-modal web-based program that aims to improve executive function in children with unilateral cerebral palsy. The control group did not	20 weeks	No significant differences were noted in any of the studied outcomes

			through the D-KEFs Tower Test, information processing through the WISC-IV Symbol Search and Coding, Executive function performance through the parent report BRIEF	received any further intervention		
Piovesana et al., 2017b	Australia	60 children and adolescent with acquired brain injury	Executive functioning was evaluated on four domains: attentional control, cognitive flexibility, goal setting, and information	The multi-modal web-based therapy program "Move it to improve it", which was administrated 6 times per week in 30 minutes sessions	20 weeks	No differences were noted between the two groups

			processing using subtests from the Wechsler Intelligence Scale for Children (WISC-IV), Delis-Kaplan Executive Functioning System (D-KEFS), Comprehensive Trail Making Test (CTMT), Tower of London (TOL), and Test of Everyday Attention for Children (Tea-Ch). Executive functioning performance in			

			everyday life was evaluated through parent questionnaire (Behaviour Rating Inventory of Executive Functioning; BRIEF).			
Szturm et al., 2022	Canada	20 children with cerebral palsy	Pediatric Balance Scale (PBS), Gross Motor Function Measure-88 (GMFM), computerized assessments of standing balance performance during several	The intervention group received a game-based balance training program, while the control group a standard balance training program. The frequency was 3 times per week for 12 weeks (45 minutes per	At the end of the intervention	Compliance was 100% for all 20 participants. Those in the intervention group demonstrated greater improvements in PBS, GMFM and balance performance. The

			dual-task conditions, open questions regarding the interventional content	session)		open questions indicated a great interest of the intervention group participants for the interventional content

The quality assessment analysis is presented at the following table. As indicated by the table, the range was between 2-5. Apart from the study carried out by Barkin et al. (2023), all studies had at least a negative evaluated point. Four of those studies were evaluated with 2/5, while one study was evaluated with 4/5.

Table 2. The Jadad Scale evaluation						
	Baque et al., 2017	Barkin et al., 2023	Dursun et al., 2019	Piovesana et al., 2017a	Piovesana et al., 2017b	Szturm et al., 2022
1. Randomization						
1.a Randomization is mentioned	Yes	Yes	Yes	Yes	Yes	Yes
1.b The method is appropriate	Yes	Yes	Yes	Yes	Yes	Yes
2. Blinding						
2.1 Blinding is mentioned	No	Yes	Yes	No	No	No
2.2 Blinding is appropriate	No	Yes	Yes	No	No	No
3. Withdrawals	No	Yes	No	No	No	No
Total score	2	5	4	2	2	2

CHAPTER 5: DISCUSSION

This study aimed to evaluate the potential difference between telerehabilitation and traditional rehabilitation in children. As indicated by the study results, two of the studies indicated no beneficial effects for children (Piovesana et al., 2017a; Piovesana et al., 2017b), while four studies led to significant positive effects (Baque et al., 2017; Barkin et al., 2023; Dursun et al., 2023; Szturm et al., 2022). More specifically, the studies on cerebral palsy and acquired brain injury led to mixed effects, while the study on ADHD patients and patients with organic academia lead to positive effects for the patients.

Based on the aforementioned data, this systematic review indicates that ADHD children could face significant benefits from telerehabilitation, since Barkin et al. (2023) found a significant impact in motor skills. A few theoretical attributions could be suggested for this beneficial effect. Telerehabilitation eliminates the need for families to travel long distances to access specialized ADHD services, making it accessible to children in rural or underserved areas. Teletherapy offers flexible scheduling options, accommodating busy family routines, school schedules, and the ADHD children specific needs, enhancing overall convenience. Children with ADHD can struggle with punctuality and consistency. Telerehabilitation minimizes the risk of missed appointments by providing therapy in a familiar, comfortable environment. It also enables continuous monitoring and adjustment of treatment plans, ensuring that interventions remain tailored to the child's evolving needs. In addition, these platforms often employ interactive tools and games that can engage children with ADHD, making therapy sessions more enjoyable and productive. Telerehabilitation minimizes external distractions often present in clinic settings, helping children stay focused during sessions. Furthermore, telerehabilitation encourages active parental involvement in therapy sessions. Parents can learn strategies to support their child's progress and implement them in the home environment. The effects for the students could be explained by less stigma. Some children with ADHD may feel stigmatized or anxious about attending in-person therapy. Teletherapy potentially offers a more discreet and less intimidating option. In conclusion, telerehabilitation has the potential to offer numerous advantages over traditional rehabilitation for children with ADHD. Its accessibility, convenience, flexibility, engagement tools, family involvement, data-driven care, and cost-effectiveness make it a compelling option. By leveraging

technology to tailor interventions and provide consistent, convenient care, telerehabilitation can lead to more significant benefits for children with ADHD and their families. The aforementioned benefits could explain the effects of telerehabilitation on children with ADHD.

Telerehabilitation also had significant benefits for patients with organic academia. Organic academia is a rare and complex group of inherited metabolic disorders that require specialized care (Najafi et al., 2016). Telerehabilitation, the remote delivery of rehabilitation services using technology, has, as indicated by the study of Dursun et al. (2023), the potential to offer several advantages over traditional in-person rehabilitation for children with organic acidemia. Organic acidemia patients often need access to specialized medical and therapeutic expertise that may not be available locally. Telerehabilitation connects patients to experts, regardless of their physical location, ensuring that children receive the best possible care. Children with organic acidemia can be sensitive to physical stress. Telerehabilitation eliminates the need for long and potentially exhausting visits to medical facilities, reducing the risk of metabolic crises triggered by travel-related stress. It enables real-time monitoring of a child's condition and progress during therapy sessions, allowing for immediate adjustments to the treatment plan as needed (McCue et al., 2010). Moreover, organic acidemia often requires lifelong management (Najafi et al., 2016). Telerehabilitation ensures that children can receive consistent care over extended periods without disruptions. Furthermore, therapy sessions conducted at home provide children with organic acidemia a comfortable and familiar environment, reducing anxiety and potential distress associated with clinic visits. Indeed, telerehabilitation encourages active family participation, enabling parents to become more involved in their child's therapy within the home setting (McCue et al., 2010). In conclusion, telerehabilitation holds great promise for children with organic acidemia, offering accessibility to expertise, reducing physical stress, enabling continuous care, providing a comfortable home-based environment, and facilitating data-driven and cost-effective therapy. By harnessing the power of technology, telerehabilitation can maximize the benefits of rehabilitation services for children with organic acidemia, improving their quality of life and long-term outcomes.

This systematic review had several limitations which have to be mentioned. A first limitation of the study was the low number of trials included. Indeed, the search

process led to only six studies meeting the inclusion and exclusion criteria, a number that has to be considered fairly low. A second limitation of this systematic review was the low level of the quality appraisal. As indicated by the analysis on the Jadad Scale, four of the studies received only two points. This assessments indicates a high risk of bias for our study. A third limitation of the study was that some types of disorders and supportive care needs that have a considerable prevalence in children were not investigated by the trials examined by the present systematic review. For example, autism was not examined in any of the studies. Hence, this systematic review helps us draw some conclusions for children with specific supportive care needs and disorders. Finally, there is a discrepancy of the results regarding cerebral palsy and acquired brain injury, since half of the studies indicated that telerehabilitation is superior and two studies that telerehabilitation is not superior to traditional relabilitation. In general, the findings of the present systematic review are prone to several limitations.

Based on the aim, the results and the limitations of this study, a few suggestions for future trials could be mentioned. First, it is of most importance to emphasize on high quality trials, investigating the difference of telerehabilitation in comparison to traditional rehabilitation through blinded randonized trials. Of course, double blinding is impossible, since the participants are aware of the group they are allocated, but assessor blinding is possible and could lead to findings that are less prone to bias. In addition, future studies have to report in detail the withdrawal reasons of the participants, since they are important to understand potential barriers that make the participation in such trials more difficult.

Apart from the suggestions for future studies, there are also some practical implications for the health systems arising from the specific systematic review, especially for the patient groups with the most benefits. Telerehabilitation has emerged as a game-changing innovation in healthcare, offering numerous advantages for patients and healthcare systems alike. Telerehabilitation can significantly reduce healthcare expenditures associated with traditional in-person rehabilitation. Children with disorders and disabilities often require ongoing and specialized care, leading to high treatment costs. Telerehabilitation minimizes expenses related to transportation, facility maintenance, and administrative overhead, resulting in cost savings for healthcare systems. Traditional rehabilitation facilities may have limited capacity and lengthy waiting lists, which can lead to inefficiencies in resource utilization.

Telerehabilitation allows healthcare systems to maximize their resources by serving a larger number of children simultaneously. This efficient allocation of resources ensures that more children can receive the care they need promptly. Children with disorders and disabilities are at a higher risk of hospital readmissions due to complications or deteriorating conditions. Telerehabilitation can help prevent such readmissions by providing ongoing monitoring and support. This proactive approach reduces the strain on healthcare systems and avoids the costs associated with repeat hospital stays. In addition, telerehabilitation enables early intervention and preventive care, which can lead to substantial cost savings in the long run. By identifying and addressing issues at an early stage, healthcare systems can avoid more extensive and expensive treatments, reducing the overall economic burden (McCue et al., 2010). Since this study indicated benefits from telerehabilitation compared to traditional rehabilitation, health systems should adopt telerehabilitation, to improve the health of children affected by ADHD and organic academia and to decrease the cost for the health systems. In addition, telerehabilitation could be also beneficial for children were no comparative benefit was reported compare to traditional rehabilitation, such as children with cerebral palsy and acquired brain injury, since telerehabilitation services, equally beneficial to traditional rehabilitation, could be accessible by a higher number of children.

CHAPTER 6: CONCLUSIONS

This systematic review investigated the potential difference between traditional rehabilitation and telerehabilitation in children. Tele-rehabilitation could have several advantages compared to traditional rehabilitation, such as increased accessibility, convenience, cost-effectiveness, reduced wait times, enhanced patient engagement, personalized care, improved continuity of care, greater compliance and higher family involvement. A search on Pubmed and Scopus was utilized to find related trials. A total of 231 studies were identified through database searching. Two additional studies were identified through snowball. In total, 131 studies remained after duplicates removal and were assessed by title. From those studies, 101 were excluded by title, since they were obviously inappropriate. Twenty-four studies did not meet the inclusion and exclusion criteria and, therefore, 6 studies were finally included in the systematic review. As indicated by the study results, two of the studies indicated no beneficial effects for children, while four studies led to significant positive effects. More specifically, the studies on cerebral palsy and acquired brain injury led to mixed effects, while the study on ADHD patients and patients with organic academia lead to positive effects for the patients. Hence, telerehabilitation could have further benefits compared to traditional rehabilitation in children with some diseases, although further research in children with other supportive care needs (e.g. autism) is essential to draw related conclusions and to make strong suggestions for the adoption of rehabilitation by healthcare systems.

REFERENCES

Abramowicz, S., Kim, S., Prahalad, S., Chouinard, A. F. and Kaban, L. B. (2016). Juvenile arthritis: current concepts in terminology, etiopathogenesis, diagnosis, and management. *International journal of oral and maxillofacial surgery*, *45*(7), pp. 801-812.

Ahmed, K. M. and Al Dhubaib, B. (2011). Zotero: A bibliographic assistant to researcher. *Journal of Pharmacology and Pharmacotherapeutics*, *2*(4), pp. 303.

Andersson, P. B. and Rando, T. A. (1999). Neuromuscular disorders of childhood. *Current Opinion in Pediatrics*, *11*(6), pp. 497-503.

Askins, M. A. and Moore, B. D. (2008). Psychosocial support of the pediatric cancer patient: Lessons learned over the past 50 years. *Current oncology reports*, *10*, pp. 469-476.

Arseniou S, Siokas V, Aloizou AM, Stamati P, Mentis AA, Tsouris Z, Dastamani M, Peristeri E, Valotassiou V, Bogdanos DP, Hadjigeorgiou GM, Dardiotis E. SLC2A3 rs12842 polymorphism and risk for Alzheimer's disease. Neurol Res. 2020;42(10):853-61. Epub 20200704. doi: 10.1080/01616412.2020.1786973. PubMed PMID: 32627711.

Averis, A. and Pearson, A. (2003). Filling the gaps: identifying nursing research priorities through the analysis of completed systematic reviews. *Jbi Reports*, *1*(3), pp. 49-126.

Babbie, E. R. (2013). *The basics of social research.* Boston: Cengage Learning.

Baliga, S. and Yock, T. I. (2020). Pediatric cancer. *Hematology/Oncology Clinics*, *34*(1), pp. 143-159.

Baque, E., Barber, L., Sakzewski, L. and Boyd, R. N. (2017). Randomized controlled trial of web-based multimodal therapy for children with acquired brain injury to improve gross motor capacity and performance. *Clinical rehabilitation*, *31*(6), pp. 722-732.

Barkın, K., Ege, T., Özgün, K. K., Koray, K. and Sedef, Ş. (2023). How does therapist guided game-based intervention program effect motor skills in children with

Attention Deficit Hyperactivity Disorder? Single blind randomised study design. *Research in Developmental Disabilities*, *137*, pp. 104495.

Bent, M. A., Stork, N. C. and Nemeth, B. A. (2020). The diagnosis and management of common childhood orthopedic disorders: An update. *Current problems in pediatric and adolescent health care*, *50*(10), pp. 100884.

Bray, P., Bundy, A. C., Ryan, M. M. and North, K. N. (2010). Feasibility of a computerized method to measure quality of "everyday" life in children with neuromuscular disorders. *Physical & Occupational Therapy in Pediatrics*, *30*(1), pp. 43-53.

Brennan, D., Georgeadis, A. and Baron, C. (2002). Telerehabilitation tools for the provision of remote speech-language treatment. *Topics in Stroke Rehabilitation*, *8*(4), pp. 71-78.

Brigo, E., Rintala, A., Kossi, O., Verwaest, F., Vanhoof, O., Feys, P. and Bonnechère, B. (2022). Using telehealth to guarantee the continuity of rehabilitation during the COVID-19 pandemic: a systematic review. *International Journal of Environmental Research and Public Health*, *19*(16), pp. 10325.

Cárdenas, J. F., Rho, J. M. and Kirton, A. (2011). Pediatric stroke. *Child's Nervous System*, *27*, pp. 1375-1390.

Cason, J. (2009). A pilot telerehabilitation program: Delivering early intervention services to rural families. *International Journal of Telerehabilitation*, *1*(1), pp. 29.

Chelban V, Wilson MP, Warman Chardon J, Vandrovcova J, Zanetti MN, Zamba-Papanicolaou E, Efthymiou S, Pope S, Conte MR, Abis G, Liu YT, Tribollet E, Haridy NA, Botía JA, Ryten M, Nicolaou P, Minaidou A, Christodoulou K, Kernohan KD, Eaton A, Osmond M, Ito Y, Bourque P, Jepson JEC, Bello O, Bremner F, Cordivari C, Reilly MM, Foiani M, Heslegrave A, Zetterberg H, Heales SJR, Wood NW, Rothman JE, Boycott KM, Mills PB, Clayton PT, Houlden H. PDXK mutations cause polyneuropathy responsive to pyridoxal 5'-phosphate supplementation. Ann Neurol. 2019;86(2):225-40. Epub 20190701. doi: 10.1002/ana.25524. PubMed PMID: 31187503; PubMed Central PMCID: PMCPMC6772106.

Clarimon J, Xiromerisiou G, Eerola J, Gourbali V, Hellström O, Dardiotis E, Peuralinna T, Papadimitriou A, Hadjigeorgiou GM, Tienari PJ, Singleton AB. Lack of evidence for a genetic association between FGF20 and Parkinson's disease in Finnish and Greek patients. BMC Neurol. 2005;5:11. Epub 20050620. doi: 10.1186/1471-2377-5-11. PubMed PMID: 15967032; PubMed Central PMCID: PMCPMC1183215.

Cohen, M. S. (1999). Families coping with childhood chronic illness: A research review. *Families, Systems and Health*, *17*(2), pp. 149.

Cooper, R. A., Fitzgerald, S. G., Boninger, M. L., Brienza, D. M., Shapcott, N., Cooper, R. and Flood, K. (2001). Telerehabilitation: Expanding access to rehabilitation expertise. *Proceedings of the IEEE*, *89*(8), pp. 1174-1193.

Copp, A. J., Adzick, N. S., Chitty, L. S., Fletcher, J. M., Holmbeck, G. N. and Shaw, G. M. (2015). Spina bifida. *Nature reviews Disease primers*, *1*(1), pp. 1-18.

Dardiotis E, Paterakis K, Tsivgoulis G, Tsintou M, Hadjigeorgiou GF, Dardioti M, Grigoriadis S, Simeonidou C, Komnos A, Kapsalaki E, Fountas K, Hadjigeorgiou GM. AQP4 tag single nucleotide polymorphisms in patients with traumatic brain injury. J Neurotrauma. 2014;31(23):1920-6. Epub 20141010. doi: 10.1089/neu.2014.3347. PubMed PMID: 24999750; PubMed Central PMCID: PMCPMC4238262.

Dardiotis E, Siokas V, Moza S, Kosmidis MH, Vogiatzi C, Aloizou AM, Geronikola N, Ntanasi E, Zalonis I, Yannakoulia M, Scarmeas N, Hadjigeorgiou GM. Pesticide exposure and cognitive function: Results from the Hellenic Longitudinal Investigation of Aging and Diet (HELIAD). Environ Res. 2019;177:108632. Epub 20190813. doi: 10.1016/j.envres.2019.108632. PubMed PMID: 31434017.

Dardiotis E, Siokas V, Zafeiridis T, Paterakis K, Tsivgoulis G, Dardioti M, Grigoriadis S, Simeonidou C, Deretzi G, Zintzaras E, Jagiella J, Hadjigeorgiou GM. Integrins AV and B8 Gene Polymorphisms and Risk for Intracerebral Hemorrhage in Greek and Polish Populations. Neuromolecular Med. 2017;19(1):69-80. Epub 20160730. doi: 10.1007/s12017-016-8429-3. PubMed PMID: 27476161.

Dardiotis E, Sokratous M, Tsouris Z, Siokas V, Mentis AA, Aloizou AM, Michalopoulou A, Bogdanos DP, Xiromerisiou G, Deretzi G, Kountouras J, Hadjigeorgiou GM. Association between Helicobacter pylori infection and Guillain-Barré Syndrome: A meta-analysis. Eur J Clin Invest. 2020;50(5):e13218. Epub 20200325. doi: 10.1111/eci.13218. PubMed PMID: 32124432.

Dardiotis E, Tsouris Z, Aslanidou P, Aloizou AM, Sokratous M, Provatas A, Siokas V, Deretzi G, Hadjigeorgiou GM. Body mass index in patients with Multiple Sclerosis: a meta-analysis. Neurol Res. 2019;41(9):836-46. Epub 20190531. doi: 10.1080/01616412.2019.1622873. PubMed PMID: 31146649.

Dewan R, Chia R, Ding J, Hickman RA, Stein TD, Abramzon Y, Ahmed S, Sabir MS, Portley MK, Tucci A, Ibáñez K, Shankaracharya FNU, Keagle P, Rossi G, Caroppo P, Tagliavini F, Waldo ML, Johansson PM, Nilsson CF, Rowe JB, Benussi L, Binetti G, Ghidoni R, Jabbari E, Viollet C, Glass JD, Singleton AB, Silani V, Ross OA, Ryten M, Torkamani A, Tanaka T, Ferrucci L, Resnick SM, Pickering-Brown S, Brady CB, Kowal N, Hardy JA, Van Deerlin V, Vonsattel JP, Harms MB, Morris HR, Ferrari R, Landers JE, Chiò A, Gibbs JR, Dalgard CL, Scholz SW, Traynor BJ. Pathogenic Huntingtin Repeat Expansions in Patients with Frontotemporal Dementia and Amyotrophic Lateral Sclerosis. Neuron. 2021;109(3):448-60.e4. Epub 20201126. doi: 10.1016/j.neuron.2020.11.005. PubMed PMID: 33242422; PubMed Central PMCID: PMCPMC7864894.

Diamond, B. J., Shreve, G. M., Bonilla, J. M., Johnston, M. V., Morodan, J. and Branneck, R. (2003). Telerehabilitation, cognition and user-accessibility. *NeuroRehabilitation*, *18*(2), pp. 171-177.

Dostie, R., Gaboury, I., Trottier, N., Hurtubise, K. and Camden, C. (2023). Acceptability of a Multimodal Telerehabilitation Intervention for Children Ages 3–8 Years with Motor Difficulties: Results of a Qualitative Study. *Developmental Neurorehabilitation* [e-pub, published ahead of print].

Dowling, J. J., D. Gonorazky, H., Cohn, R. D. and Campbell, C. (2018). Treating pediatric neuromuscular disorders: the future is now. *American Journal of Medical Genetics Part A*, *176*(4), pp. 804-841.

Duffy, C. M. (2005). Measurement of health status, functional status, and quality of life in children with juvenile idiopathic arthritis: clinical science for the pediatrician. *Pediatric Clinics*, *52*(2), pp. 359-372.

Dursun, E. L., Bumin, G., Çıkı, K. and Sivri, S. (2023). Efficacy of Tele-CO-OP in Children With Organic Acidemia: A Pilot Randomized Controlled Trial. *OTJR: Occupational Therapy Journal of Research*, pp. 15394492231156907.

Emery, A. E. (2002). The muscular dystrophies. *The Lancet*, *359*(9307), pp. 687-695.

Erdmann, F., Frederiksen, L. E., Bonaventure, A., Mader, L., Hasle, H., Robison, L. L. and Winther, J. F. (2021). Childhood cancer: survival, treatment modalities, late effects and improvements over time. *Cancer epidemiology*, *71*, pp. 101733.

Egger, M., Smith, G. D. and O'Rourke, K. (2001). Introduction: rationale, potentials, and promise of systematic reviews. *Systematic reviews in health care: meta-analysis in context*, pp. 1-19.

Fiani, B., Siddiqi, I., Lee, S. C. and Dhillon, L. (2020). Telerehabilitation: development, application, and need for increased usage in the COVID-19 era for patients with spinal pathology. *Cureus*, *12*(9), pp. 1-7.

Galgano, M., Toshkezi, G., Qiu, X., Russell, T., Chin, L. and Zhao, L. R. (2017). Traumatic brain injury: current treatment strategies and future endeavors. *Cell transplantation*, *26*(7), pp. 1118-1130.

Ganapathy, K. (2021). Telerehabilitation: an overview. *Telehealth Med. Today*, *6*, pp. 1-14.

Giesbrecht, E., Major, M. E., Fricke, M. et al. (2023). Telerehabilitation delivery in Canada and the Netherlands: results of a survey study. *JMIR Rehabilitation and Assistive Technologies*, *10*(1), pp. e45448.

Gilson, K. M., Davis, E., Reddihough, D., Graham, K. and Waters, E. (2014). Quality of life in children with cerebral palsy: implications for practice. *Journal of Child Neurology*, *29*(8), pp. 1134-1140.

Gordon, A. L., Nguyen, L., Panton, A., Mallick, A. A., Ganesan, V., Wraige, E. and McKevitt, C. (2018). Self-reported needs after pediatric stroke. *european journal of paediatric neurology*, *22*(5), pp. 791-796.

Goyenvalle, A., Seto, J. T., Davies, K. E. and Chamberlain, J. (2011). Therapeutic approaches to muscular dystrophy. *Human molecular genetics*, *20*(R1), pp. R69-R78.

Gregory, P., Alexander, J. and Satinsky, J. (2011). Clinical telerehabilitation: applications for physiatrists. *PM&R*, *3*(7), pp. 647-656.

Gombatto, S. P., Archer, K. R., Wegener, S. T. et al. (2023). Protocol for a Parallel Group Randomized Clinical Trial Comparing a Culturally Adapted Cognitive Behavioral Telerehabilitation Intervention to Usual Physical Therapy for Latino Patients with Chronic Spine Pain. *Physical Therapy*, pp. 68.

Grootenhuis, M. A., De Boone, J. and Van der Kooi, A. J. (2007). Living with muscular dystrophy: health related quality of life consequences for children and adults. *Health and quality of life outcomes*, *5*(1), pp. 1-8.

Habibi, S., Saleem, M. A. and Ramanan, A. V. (2011). Juvenile systemic lupus erythematosus: review of clinical features and management. *Indian pediatrics*, *48*(11), pp. 879-887.

Hadjigeorgiou GM, Kountra PM, Koutsis G, Tsimourtou V, Siokas V, Dardioti M, Rikos D, Marogianni C, Aloizou AM, Karadima G, Ralli S, Grigoriadis N, Bogdanos D, Panas M, Dardiotis E. Replication study of GWAS risk loci in Greek multiple sclerosis patients. Neurol Sci. 2019;40(2):253-60. Epub 20181026. doi: 10.1007/s10072-018-3617-6. PubMed PMID: 30361804.

Hailey, D., Roine, R., Ohinmaa, A. and Dennett, L. (2011). Evidence of benefit from telerehabilitation in routine care: a systematic review. *Journal of telemedicine and telecare*, *17*(6), pp. 281-287.

Hill, K. (2010). Advances in augmentative and alternative communication as quality-of-life technology. *Physical Medicine and Rehabilitation Clinics*, *21*(1), pp. 43-58.

Honda, E., Tokunaga, T., Oshima, Y., Kuratomi, A., Sigemori, M., Ogasawara, T. and Hayashi, T. (1992). MRI findings of closed head injury in children; with special reference to the effect of central shearing force. *No Shinkei geka. Neurological Surgery*, *20*(3), pp. 235-242.

International Multiple Sclerosis Genetics Consortium. A systems biology approach uncovers cell-specific gene regulatory effects of genetic associations in multiple sclerosis. Nat Commun. 2019;10(1):2236. Epub 20190520. doi: 10.1038/s41467-019-09773-y. PubMed PMID: 31110181; PubMed Central PMCID: PMCPMC6527683.

Iskandar, B. J. and Finnell, R. H. (2022). Spina bifida. *New England Journal of Medicine*, *387*(5), pp. 444-450.

Jadad, A. R., Moore, R. A., Carroll, D., Jenkinson, C., Reynolds, D. J., Gavaghan, D. J. and McQuay, H. J. (1996). Assessing the quality of reports of randomized clinical trials: Is blinding necessary? *Controlled Clinical Trials, 17*(1), pp. 1-12.

Jang H, Bae JB, Dardiotis E, Scarmeas N, Sachdev PS, Lipnicki DM, Han JW, Kim TH, Kwak KP, Kim BJ, Kim SG, Kim JL, Moon SW, Park JH, Ryu SH, Youn JC, Lee DY, Lee DW, Lee SB, Lee JJ, Jhoo JH, Yannakoulia M, Kosmidis MH, Hadjigeorgiou GM, Sakka P, Kim KW. Differential effects of completed and incomplete pregnancies on the risk of Alzheimer disease. Neurology. 2018;91(7):e643-e51. Epub 20180718. doi: 10.1212/wnl.0000000000006000. PubMed PMID: 30021919; PubMed Central PMCID: PMCPMC9811944.

Jordan, L. C. and Hillis, A. E. (2011). Challenges in the diagnosis and treatment of pediatric stroke. *Nature Reviews Neurology*, *7*(4), pp. 199-208.

Khan, K. S., Kunz, R., Kleijnen, J. and Antes, G. (2003). Five steps to conducting a systematic review. *Journal of the royal society of medicine*, *96*(3), pp. 118-121.

Kim, J. J. and Gean, A. D. (2011). Imaging for the diagnosis and management of traumatic brain injury. *Neurotherapeutics*, *8*, pp. 39-53.

Leisenring, W. M., Mertens, A. C., Armstrong, G. T. et al. (2009). Pediatric cancer survivorship research: experience of the Childhood Cancer Survivor Study. *Journal of clinical oncology*, *27*(14), pp. 2319.

Liampas I, Kyriakoulopoulou P, Siokas V, Tsiamaki E, Stamati P, Kefalopoulou Z, Chroni E, Dardiotis E. Apolipoprotein E Gene in α-Synucleinopathies: A Narrative Review. Int J Mol Sci. 2024;25(3). Epub 20240201. doi: 10.3390/ijms25031795. PubMed PMID: 38339074; PubMed Central PMCID: PMCPMC10855384.

Liampas I, Siokas V, Mentis A-FA, Aloizou A-M, Dastamani M, Tsouris Z, Aslanidou P, Brotis A, Dardiotis E. Serum Homocysteine, Pyridoxine, Folate, and Vitamin B12 Levels in Migraine: Systematic Review and Meta-Analysis. Headache: The Journal of Head and Face Pain. 2020;60(8):1508-34. doi:

Liampas I, Danga F, Kyriakoulopoulou P, Siokas V, Stamati P, Messinis L, Dardiotis E, Nasios G. The Contribution of Functional Near-Infrared Spectroscopy (fNIRS) to the Study of Neurodegenerative Disorders: A Narrative Review. Diagnostics (Basel). 2024;14(6). Epub 20240321. doi: 10.3390/diagnostics14060663. PubMed PMID: 38535081; PubMed Central PMCID: PMCPMC10969335.

Liampas I, Siokas V, Mentis AA, Aloizou AM, Dastamani M, Tsouris Z, Aslanidou P, Brotis A, Dardiotis E. Serum Homocysteine, Pyridoxine, Folate, and Vitamin B12 Levels in Migraine: Systematic Review and Meta-Analysis. Headache. 2020;60(8):1508-34. Epub 20200702. doi: 10.1111/head.13892. PubMed PMID: 32615014.

Lightfoot, C., Cole, M. and Cole, S. R. (2014). *The development of children*. Athens: Gutenberg Publications.

Lue, Y. J., Lin, R. F., Chen, S. S. and Lu, Y. M. (2009). Measurement of the functional status of patients with different types of muscular dystrophy. *The Kaohsiung journal of medical sciences*, *25*(6), pp. 325-333.

Luijten LWG, Leonhard SE, van der Eijk AA, Doets AY, Appeltshauser L, Arends S, Attarian S, Benedetti L, Briani C, Casasnovas C, Castellani F, Dardiotis E, Echaniz-Laguna A, Garssen MPJ, Harbo T, Huizinga R, Humm AM, Jellema K, van der Kooi AJ, Kuitwaard K, Kuntzer T, Kusunoki S, Lascano AM, Martinez-Hernandez E, Rinaldi S, Samijn JPA, Scheidegger O, Tsouni P, Vicino A, Visser LH, Walgaard C, Wang Y, Wirtz PW, Ripellino P, Jacobs BC. Guillain-Barré syndrome after SARS-CoV-2 infection in an international prospective cohort

study. Brain. 2021;144(11):3392-404. doi: 10.1093/brain/awab279. PubMed PMID: 34553216; PubMed Central PMCID: PMCPMC8677532.

Mamalaki E, Anastasiou CA, Ntanasi E, Tsapanou A, Kosmidis MH, Dardiotis E, Hadjigeorgiou GM, Sakka P, Scarmeas N, Yannakoulia M. Associations between the mediterranean diet and sleep in older adults: Results from the hellenic longitudinal investigation of aging and diet study. Geriatr Gerontol Int. 2018;18(11):1543-8. Epub 20180905. doi: 10.1111/ggi.13521. PubMed PMID: 30187649.

Martin, D. A. (1988). Children and adolescents with traumatic brain injury: Impact on the family. *Journal of Learning Disabilities*, *21*(8), pp. 464-470.

McCue, M., Fairman, A. and Pramuka, M. (2010). Enhancing quality of life through telerehabilitation. *Physical Medicine and Rehabilitation Clinics*, *21*(1), pp. 195-205.

McMillan, H. J., Darras, B. T. and Kang, P. B. (2011). Autoimmune neuromuscular disorders in childhood. *Current treatment options in Neurology*, *13*, pp. 590-607.

Mercuri, E. and Muntoni, F. (2013). Muscular dystrophies. *The Lancet*, *381*(9869), pp. 845-860.

Michael-Asalu, A., Taylor, G., Campbell, H., Lelea, L. L. and Kirby, R. S. (2019). Cerebral palsy: diagnosis, epidemiology, genetics, and clinical update. *Advances in pediatrics*, *66*, pp. 189-208.

Michelakakis H, Xiromerisiou G, Dardiotis E, Bozi M, Vassilatis D, Kountra PM, Patramani G, Moraitou M, Papadimitriou D, Stamboulis E, Stefanis L, Zintzaras E, Hadjigeorgiou GM. Evidence of an association between the scavenger receptor class B member 2 gene and Parkinson's disease. Mov Disord. 2012;27(3):400-5. Epub 20120105. doi: 10.1002/mds.24886. PubMed PMID: 22223122.

Moher, D., Liberati, A., Tetzlaff, J. and Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of internal medicine*, *151*(4), pp. 264-269.

Najafi, R., Hashemipour, M., Mostofizadeh, N. et al. (2016). Demographic and clinical findings in pediatric patients affected by organic acidemia. *Iranian journal of child neurology*, *10*(2), pp. 74.

Nemeth, B. (2011). The diagnosis and management of common childhood orthopedic disorders. *Current problems in pediatric and adolescent health care*, *41*(1), pp. 2-28.

Nousia A, Martzoukou M, Siokas V, Aretouli E, Aloizou AM, Folia V, Peristeri E, Messinis L, Nasios G, Dardiotis E. Beneficial effect of computer-based multidomain cognitive training in patients with mild cognitive impairment. Appl Neuropsychol Adult. 2021;28(6):717-26. Epub 20191229. doi: 10.1080/23279095.2019.1692842. PubMed PMID: 31885287.

Nuara, A., Fabbri-Destro, M., Scalona, E., Lenzi, S. E., Rizzolatti, G. and Avanzini, P. (2022). Telerehabilitation in response to constrained physical distance: an opportunity to rethink neurorehabilitative routines. *Journal of neurology*, *269*(2), pp. 627-638.

Ogourtsova, T., Boychuck, Z., O'Donnell, M., Ahmed, S., Osman, G. and Majnemer, A. (2023). Telerehabilitation for children and youth with developmental disabilities and their families: A systematic review. *Physical & Occupational Therapy in Pediatrics*, *43*(2), pp. 129-175.

Orcesi, S., Ariaudo, G., Mercuri, E., Beghi, E., Rezzani, C. and Balottin, U. (2014). A new self-report quality of life questionnaire for children with neuromuscular disorders: presentation of the instrument, rationale for its development, and some preliminary results. *Journal of child neurology*, *29*(2), pp. 167-181.

Pearson, A., Wiechula, R., Court, A. and Lockwood, C. (2005). The JBI model of evidence-based healthcare. *International Journal of Evidence-Based Healthcare*, *3*(8), pp. 207-215.

Pelekasis, P. (2021). Forecasting the Long-Term Effects of the Pandemic on Children: Towards a COVID-Generation. In: F. Gabrielli and F. Irtelli, *Anxiety, Uncertainty, and Resilience During the Pandemic Period - Anthropological and Psychological Perspectives.* London: Intech Publishing.

Piovesana, A., Ross, S., Lloyd, O., Whittingham, K., Ziviani, J., Ware, R. S. and Boyd, R. N. (2017a). Randomized controlled trial of a web-based multi-modal therapy program for executive functioning in children and adolescents with unilateral cerebral palsy. *Disability and Rehabilitation*, *39*(20), pp. 2021-2028.

Piovesana, A., Ross, S., Lloyd, O. et al. (2017b). A randomised controlled trial of a web-based multi-modal therapy program to improve executive functioning in children and adolescents with acquired brain injury. *Clinical rehabilitation*, *31*(10), pp. 1351-1363.

Prabawa, I. M. Y., Silakarma, D. and Widnyana, M. (2021). Telerehabilitation as a physical therapy solution for post-stroke patient in COVID-19 pandemic situations: A review. *Intisari Sains Medis*, *12*(1), pp. 1-5.

Prakken, B., Albani, S. and Martini, A. (2011). Juvenile idiopathic arthritis. *The Lancet*, *377*(9783), pp. 2138-2149.

Prvu Bettger, J. and Resnik, L. J. (2020). Telerehabilitation in the age of COVID-19: an opportunity for learning health system research. *Physical therapy*, *100*(11), pp. 1913-1916.

Rawanduzy, C. A., Earl, E., Mayer, G. and Lucke-Wold, B. (2022). Pediatric stroke: a review of common etiologies and management strategies. *Biomedicines*, *11*(1), pp. 2.

https://doi.org/10.1111/head.13892.

Rikos D, Siokas V, Mentis AA, Aloizou AM, Liampas I, Tsouris Z, Peristeri E, Stamati P, Hadjigeorgiou GM, Dardiotis E. TREM2 R47H variant and risk for Alzheimer's disease: assessment in a Greek population and updated meta-analysis. Int J Neurosci. 2022:1-9. Epub 20221206. doi: 10.1080/00207454.2022.2150844. PubMed PMID: 36408688.

Ryś P, Władysiuk M, Skrzekowska-Baran I and Małecki MT. (2009). Review articles, systematic reviews and meta-analyses: which can be trusted? *Pol Arch Med Wewn*, 119(3), pp. 148-56.

Sandler, A. D. (2010). Children with spina bifida: key clinical issues. *Pediatric Clinics*, *57*(4), pp. 879-892.

Scherr, J. F., Albright, C. and de Los Reyes, E. (2021). Utilizing telehealth to create a clinical model of care for patients with Batten disease and other rare diseases. *Therapeutic Advances in Rare Disease*, *2*, pp. 26330040211038564.

Schwab, K. and Malleret, T. (2020). *The Great Reset.* In World Economic Forum: Geneva, Switzerland.

Siegel, R. L., Miller, K. D., Wagle, N. S. and Jemal, A. (2023). Cancer statistics, 2023. *Ca Cancer J Clin*, *73*(1), pp. 17-48.

Siokas V, Dardiotis E, Tsironi EE, Tsivgoulis G, Rikos D, Sokratous M, Koutsias S, Paterakis K, Deretzi G, Hadjigeorgiou GM. The Role of TOR1A Polymorphisms in Dystonia: A Systematic Review and Meta-Analysis. PLoS One. 2017;12(1):e0169934. Epub 20170112. doi: 10.1371/journal.pone.0169934. PubMed PMID: 28081261; PubMed Central PMCID: PMCPMC5231385.

Siokas V, Aslanidou P, Aloizou A-M, Peristeri E, Stamati P, Liampas I, Arseniou S, Drakoulis N, Aschner M, Tsatsakis A, Mitsias PD, Bogdanos DP, Hadjigeorgiou GM, Dardiotis E. Does the CD33 rs3865444 Polymorphism Confer Susceptibility to Alzheimer's Disease? Journal of Molecular Neuroscience. 2020;70(6):851-60. doi: 10.1007/s12031-020-01507-w.

Siokas V, Stamati P, Pateraki G, Liampas I, Aloizou AM, Tsirelis D, Nousia A, Sgantzos M, Nasios G, Bogdanos DP, Dardiotis E. Analysis of SOD2 rs4880 Genetic Variant in Patients with Alzheimer's Disease. Curr Issues Mol Biol. 2022;44(10):4406-14. Epub 20220921. doi: 10.3390/cimb44100302. PubMed PMID: 36286017; PubMed Central PMCID: PMCPMC9600469.

Sokratous M, Dardiotis E, Tsouris Z, Bellou E, Michalopoulou A, Siokas V, Arseniou S, Stamati T, Tsivgoulis G, Bogdanos D, Hadjigeorgiou GM. Deciphering the role of DNA methylation in multiple sclerosis: emerging issues. Auto Immun Highlights. 2016;7(1):12. Epub 20160907. doi: 10.1007/s13317-016-0084-z. PubMed PMID: 27605361; PubMed Central PMCID: PMCPMC5014764.

Southwood, T. R., Petty, R. E., Malleson, P. N., Delgado, E. A., Hunt, D. W., Wood, B. and Schroeder, M. L. (1989). Psoriatic arthritis in children. *Arthritis & Rheumatism: Official Journal of the American College of Rheumatology*, *32*(8), pp. 1007-1013.

Stamati P, Siokas V, Aloizou AM, Karampinis E, Arseniou S, Rakitskii VN, Tsatsakis A, Spandidos DA, Gozes I, Mitsias PD, Bogdanos DP, Hadjigeorgiou GM, Dardiotis E. Does SCFD1 rs10139154 Polymorphism Decrease Alzheimer's Disease Risk? J Mol Neurosci. 2019;69(2):343-50. Epub 20190702. doi: 10.1007/s12031-019-01363-3. PubMed PMID: 31267315.

Strehle, E. M. (2009). Long-term management of children with neuromuscular disorders. *Jornal de pediatria*, *85*, pp. 379-384.

Stübgen, J. P. (2011). Neuromuscular disorders associated with hepatitis B virus infection. *Journal of Clinical Neuromuscular Disease*, *13*(1), pp. 26-37.

Thurman, D. J. (2016). The epidemiology of traumatic brain injury in children and youths: a review of research since 1990. *Journal of child neurology*, *31*(1), pp. 20-27.

Tran, V., Lam, M. K., Amon, K. L., Brunner, M., Hines, M., Penman, M., ... & Togher, L. (2017). Interdisciplinary eHealth for the care of people living with traumatic brain injury: a systematic review. *Brain injury*, *31*(13-14), pp. 1701-1710.

Tricco, A. C., Tetzlaff, J. and Moher, D. (2011). The art and science of knowledge synthesis. *Journal of clinical epidemiology*, *64*(1), pp. 11-20.

Tsika A, Stamati P, Tsouris Z, Provatas A, Papa A, Tsimoulis D, Ralli S, Siokas V, Dardiotis E. Acute Anterior Choroidal Artery Territory Infarction: A Case Series Report. Neurol Int. 2024;16(2):289-98. Epub 20240229. doi: 10.3390/neurolint16020020. PubMed PMID: 38525700; PubMed Central PMCID: PMCPMC10961810.

Vitrikas, K., Dalton, H. and Breish, D. (2020). Cerebral palsy: an overview. *American family physician*, *101*(4), pp. 213-220.

Wenar, C. and Kerig. P.K. (2008). *Developmental Psychopathology.* Athens: Gutenberg Publications.

Wilson, B. A. (1997). Cognitive rehabilitation: How it is and how it might be. *Journal of the International Neuropsychological Society*, *3*(5), pp. 487-496.

Yagolovich AV, Kuskov AN, Kulikov PP, Bagrov DV, Petrova PA, Kukovyakina EV, Isakova AA, Khan, II, Pokrovsky VS, Nosyrev AE, Stamati PC, Markvicheva

EA, Gasparian ME, Spandidos DA, Tsatsakis AM. Assessment of the effects of amphiphilic poly (N-vinylpyrrolidone) nanoparticles loaded with bortezomib on glioblastoma cell lines and zebrafish embryos. Biomed Rep. 2024;20(3):37. Epub 20240117. doi: 10.3892/br.2024.1725. PubMed PMID: 38343660; PubMed Central PMCID: PMCPMC10853758.

Zafiriou E, Daponte AI, Siokas V, Tsigalou C, Dardiotis E, Bogdanos DP. Depression and Obesity in Patients With Psoriasis and Psoriatic Arthritis: Is IL-17-Mediated Immune Dysregulation the Connecting Link? Front Immunol. 2021;12:699848. Epub 20210721. doi: 10.3389/fimmu.2021.699848. PubMed PMID: 34367160; PubMed Central PMCID: PMCPMC8334867.