



Physiotherapy in Down Syndrome: A Literature Review

Yasmin Souza Silva¹, Luciana Lane Gomes Da Silva¹,
Wellington Carlos Da Silva^{1*}, Agrinazio Geraldo Nascimento Neto¹,
Thalita De Sousa Pereira¹, Ana Karoline Campos Araújo¹,
Armando Jarib Gonçalves Tavares¹, Rafaella Alves Weber¹,
Livia Gomes De Oliveira¹, Nitiele Elizabete Cunha¹,
Leonice Costa Luz¹ and Jacqueline Aparecida Philipino Takada¹

¹Department of Physiotherapy, University of Gurupi (UnirG), Av. Rio de Janeiro, Gurupi, Tocantins, Brazil.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/INDJ/2021/v15i430160

Editor(s):

(1) Vincenzo La Bella, University of Palermo, Italy.

Reviewers:

(1) Amrita Kumari Konar, PRM Medical College and Hospital, India.

(2) Ilker Ilhanli, Ondokuz Mayıs University, Turkey.

(3) Ghanshyam Gahlot, Rajasthan University of Health Sciences, India.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/66592>

Review Article

Received 22 January 2021

Accepted 29 March 2021

Published 10 May 2021

ABSTRACT

Introduction: Down syndrome is a genetic condition arising from three chromosomal abnormalities, namely trisomy 21 (the most well-known); translocation, and/or mosaicism. This chromosome change occurs in the formation of the fetus, in more detail at the time of cell division, which will characterize the signs and symptoms of the syndrome.

Objective: The purpose of this article is to research the main scientific findings in the last 10 years regarding physical therapy treatments, to verify the best techniques and their respective results, and to address the role of physiotherapy in the development of children with Down syndrome.

Methods: The research only included studies published in the period from 2009 to 2019,

*Corresponding author: E-mail: wellingtonmcarloss9@gmail.com;

systematic review articles and limited the Portuguese and English languages were excluded, excluding all incomplete articles, duplications, abstracts that did not address, and those works that do not have a scientific basis.

Results: In this systematic review, it can be seen that the main research results were disseminated and stored in databases (SciELO, Medline, and LILACS), focusing on the study of and DS patients, specific children in early childhood. There are few studies on *down syndrome* in adults. Another important aspect is the concentration of research in the field of sports physiotherapy, few studies have focused on other areas of physiotherapy, such as respiratory, cardiovascular, and cognitive physiotherapy, which go in the opposite direction.

Conclusion: Physiotherapy for patients with DS can improve the quality and life expectancy of these individuals, but the needs of patients with this syndrome involve some physical, physiological and psychological aspects and require the attention of a multidisciplinary team.

Keywords: Physiotherapy; down syndrome; neurology.

1. INTRODUCTION

Down syndrome (DS) is a genetic condition resulting from three chromosomal abnormalities, namely trisomy 21 (the most well-known); translocation, and/or mosaicism. This chromosome change occurs in the formation of the fetus, in more detail at the time of cell division, which will characterize the signs and symptoms of the syndrome [1,2].

Every minute, 18 babies are born with a disability, which represents 9.8 million babies with disabilities per year, with DS having the highest incidence, with 91% of cases. And, among so many characteristics, postural control dysfunctions are constantly described in children with DS, as well as difficulties in motor coordination, problems with sensorimotor integration, and, also, the fact that patients take time to adapt to the environments [3]. However, mental retardation, as one of the characteristics, influences the ability to assimilate new motor skills, since there is a lack of motivation to be explored. Sensory deficits can hinder postural control of movements, coordination and balance, and, consequently, motor learning. All the senses of the human body are interconnected, that is, if one part is not well, the rest will not work properly [4].

Physiotherapy is essential for people with Down syndrome because it is through it that many pathologies can be treated, especially those of motor impairment, since this is the objective of motor physiotherapy for children with Down: to reduce the delays in gross and fine motor skills, facilitating and stimulating the postural reactions necessary for the performance of the stages of normal development; and the prevention of joint instabilities and bone deformities [4].

Physiotherapeutic treatment is geared to the patient's condition, in the case of Down syndrome as the treatment is associated with motor delays to physiotherapy, it proposes to perform gait training, transpostural changes, static and dynamic balance using specific techniques and resources on the ground and aquatic environments through aquatic physiotherapy [5].

The general objective of this article is to research what were the main scientific findings in the last 10 years regarding physiotherapeutic treatments, to verify which are the best techniques and their respective results, and to address the role of physiotherapy in the development of children with Down syndrome.

2. MATERIALS AND METHODS

To identify articles on the subject, a survey was carried out in the Lilacs, National Library of Medicine of the USA (PubMed), and Scientific Electronic Library Online (SciELO) databases. Physiotherapy is indicated for Down's Syndrome right after the child's birth, when we will start early stimulation using, for example, Baby Bobath, which seeks to inhibit the adoption of abnormal postures and promote correct postures and movements, stimulating Neuro Psychomotor Development. The search strategy on the subject was the use of the keywords:

1. Physiotherapy,
2. Down syndrome,
3. Neurology.

After consulting the databases and applying the search strategy, repeated studies were identified between the different surveys. The inclusion

criteria were original and research articles that conceptualize the role of the physiotherapist in down syndrome. The study was carried out in different types of research fields, covering research completed in Portuguese, English, and Spanish.

The excluded articles were grouped in order: repeated, irrelevant, review, other publication formats, in addition to other languages. Furthermore, manual searches were done in bibliographic references of the original articles found with the predetermined keywords.

3. RESULTS AND DISCUSSION

59 articles were found classified according to the descriptors, however, according to the inclusion and exclusion criteria, 7 articles were selected, 3 from Portuguese and 4 from English. As described in Table 1.

In this systematic review, it can be seen that the main results of the research were released and stored in a database (Scielo, Medline, and LILACS), focusing on the study of DS patients, specific children in early childhood. There are few studies on DS in adults. Another important aspect is the concentration of research in the field of sports physiotherapy, few studies have focused on other areas of physiotherapy, such as respiratory, cardiovascular, and cognitive physiotherapy, which go in the opposite direction to what Moreira et al. (2000), they reported that the effects of DS can cause respiratory, circulatory, auditory and visual deficiencies [6].

The physiotherapy offered to DS patients goes beyond the medical and health area, as the needs of these people are interdisciplinary and involve multiple areas of knowledge, including medicine, psychology, speech therapy, physiotherapy, occupational therapist, and general educator. Still, according to the authors, the performance of these professionals is considered as the main objective to improve the physical and mental skills of patients with DS, thus providing them with quality of life [7].

The motor development of a group of children with DS and another group of children without the syndrome. Statistically, it was found that children with DS had lower motor performance than children without the syndrome.8 Patients with DS have difficulties in skills involving motor control and planning, visual perception, and visual-motor integration, which will directly affect the functional skills of self-care in adulthood [8].

This delay in the motor reflex is caused by the stimulus that occurs at the level of the spinal cord and is not affected by the cerebral cortex that controls and regulates fine motor skills, which is related to the hypotonic process of patients caused by DS. This can cause the muscles to execute slower or ineffective contractions, impairing fine movements [8].

This type of damage in the process of stimulation and control of movement in patients with DS can cause damage to muscle strength, who evaluated the hand agility of children with DS and without the syndrome, found that, compared to other groups, patients with DS have inferior performance in terms of stress. The lack of this muscular strength usually affects static or dynamic postural balance [9]. The effects of sports caused by DS are more prominent in the first months of life, impairing children's motor development [10].

For the treatment of these motor dysfunctions, especially those related to the trunk and the ability to posture balance, a strategy to influence neuromuscular stimulation is the use of a multisensory motor protocol involving visual and motor perception, with a focus on improving postural ability [11].

A multisensory exercise protocol for acquiring motor skills in children with DS through hippotherapy compared to children who underwent conventional physical therapy as a means of treatment [12,13].

In this context, Porto and Ibiapina's studies aimed to mitigate the impact of the aquatic environment as an occupational therapeutic scenario to develop the body scheme of a child with Down syndrome, taking into account the therapeutic properties of water. The effectiveness of occupational therapy activities in water was monitored for the development of the examined child's body scheme. This can be useful to conduct new research on the topic - whose literature is scarce - and help to keep practices up to date [14].

In a similar study, the objective was to examine mothers' expectations regarding the development and education of the child with Down syndrome, from a psychoanalytic point of view. A qualitative study was carried out using recorded interviews, transcribed, and subsequently analyzed from a qualitative content analysis [15].

Table 1. Summary of articles published in the last 10 years

Authors	Goal	Methods	Results
Godzicki, B et al. (2010)	Evaluate the efficacy of treatment through the balance sheet for the acquisition of sit Independent in rasis with Down syndrome.	A treatment was plated in children 6 and 7 months of life lasting 30 minutes in each session, in a balance composed of platform coated with Ethyl vinyl acetate, performing linear displacements in the posterior Antero direction.	It was observed that, when stimulated early using balance, these children acquired the sit before the time described in the literature.
Corrêa, JCF et al. (2011)	Analyze and verify the existence of neurophysiological changes in individuals with DS, such as hyporeflexia, static and dynamic.	A controlled cross-sectional study was applied to 24 volunteers diagnosed with DS and 25 volunteers without DS as a control group.	In this study, it was verified the existence of a decrease in the conduction speed of the action potential, chronically, may cause impairment in the sensorimotor control of the muscles, and consequently hypotonia of these individuals.
Coppede, AC et al. (2012)	This study aimed to compare children with DS and typical children. To find motor performance, evaluated by Bayley Scales of Infant and Toddler Development–hird Edition (BSITD-III).	A cross-sectional study of the control case type. Participants were 24 children of both genders, born at term, and with adequate weight for gestational age, being 12 children belonging to the typical group (T).	Children with DS presented a profile fine and functional motor lower than children with development typical; however, the functional performance of the SD group was appropriate according to the expected for the age group.
Priori, PA et al. (2013)	This study aimed to analyze the correction between manual dexterity grip strength in children with DS and healthy children aged between 7 and 9 years.	Participants were 26 children with DS, of both sexes. The evaluation of grip strength was performed with the ammeter and that of manual dexterity by the Box and Block Test.	The SD Group presented a lower performance in both grip strength and manual dexterity, when compared to the CG; there was no correlation the significant difference between grip strength and dexterity manual in the SD Group.
Morais, KDW et al. (2016)	Study aimed to investigate the profile of physiotherapeutic care for children with DS in the first three years of age.	Qualitative study through data collected from interviews with physical therapists.	The results indicate that the main method used in treatments in children with DS is the Bobath method, with the protocol of times per week lasting an average of 30 minutes.

Authors	Goal	Methods	Results
Costa, VSF et al. (2017)	Analyze the effects of a Hippotherapy program on the variables of global motor coordination in individuals with DS of both genders and compare individuals with the same syndrome that does not practice Hippotherapy.	An exploratory study, containing 41 participants, 20 of which were hippotherapy and 21 who did not practice hippotherapy. It was used the test körperkoordinations test für Kinder.	Comparing the groups, a significant difference was observed ($p < 0.01$) for the Motor Quotient of the Lateral Jumptask, the eg with the best score (114.10) in Relation to CG (88.47), better results In global motor coordination.
Torquato, JA et al. (2017)	Check the acquisition of motor landmarks in children with DS who undergo hippotherapy or conventional physiotherapy	A cross-sectional study that applied to 33 individuals dS players aged between 4 and 13 years, of both sexes, divided into 2 groups: Group 1 while ecotherapy; Group 2 soil physiotherapy. Global motricity, static balance, and dynamic balance were evaluated using the Motor Development Scale.	Children who undergo physical therapy have better static and dynamic balance than individuals who perform hippotherapy, conventional physiotherapy had a positive influence on the achievement of motor acquisitions and static and dynamic balance in patients with DS

Twelve mothers of people with Down syndrome, aged 2 months to 23 years, participated in the study. The results showed that the diagnosis of Down syndrome has implications for mothers. As a result, it was possible to conclude that mothers have difficulty raising expectations for development and education. The importance of the support and monitoring of the mother in the exercise of motherhood and of the teachers who accompany the student with Down syndrome since school age is emphasized [15].

Thus, intending to verify the knowledge about the treatment of motor physiotherapy, in the context of early stimulation, for children with Down syndrome in the main institutions of the Municipality of Rio de Janeiro; the authors concluded that motor physiotherapy is highly representative of the early stimulation of children with Down syndrome, which, in addition to mental retardation, has a significant delay in motor development. This stimulus is the first step in the long trajectory of educational programs for this type of child, as children with Down syndrome have the potential to become independent adults in their daily activities and integrate into society [16].

Physiotherapy should guide family members and/or caregivers to provide early stimulation at all times. Therefore, the role of the family in motor development is essential. The authors aimed to describe the physiotherapeutic approach and the importance of the family's contribution to the motor development of people with Down syndrome. The study consists of a qualitative approach that consists of a descriptive, relative, and timely bibliographic review through the survey of scientific documentation [17].

He believes that the physical therapy approach is essential for better motor development of people with Down syndrome and that the family should contribute to the effectiveness of physical therapy treatment, especially in early stimulation. With that in mind, an educational physical therapy program is needed to provide counseling to family members of people with Down syndrome [17].

In this line of reasoning, the practice of recreational swimming, depending on the frequency and duration, promotes motor skills due to the experience of different experiences and the multiplicity of movements that were performed spontaneously due to the illness in class. Conclusion: We conclude that swimming is effective in improving aspects of motor development in children with Down syndrome [18].

Also, in a study on the assessment of cardiorespiratory mechanics and functional capacity in patients with Down Syndrome, the authors concluded that people with DS have airway obstruction, poor inspiratory and expiratory muscle strength, and reduced functional capacity [19].

According to the tuasaude.com.br (2019) children with Down syndrome who do motor physiotherapy usually start walking around the age of 2, while the child who does not do physiotherapy, can start walking only after 4 years of age. This demonstrates the benefits that physiotherapy has for the motor development of these children [20].

The main benefits of physiotherapy in children with Down Syndrome are reported in chart 02.

However, physiotherapeutic treatments are not only focused on sensory-motor intervention protocols, other fundamental aspects can influence the education and guidance for patients with DS in the rehabilitation process. Finally, in this systematic study, there is evidence that there are several methods of physiotherapy for patients with DS, but each method and the technology used varies according to the degree of personal impairment. Choosing a care plan is recommended for The specific needs of the patient. However, another aspect pointed out by this study is that the scientific and academic classes concentrate their efforts and research in the area of sports rehabilitation while disregarding other areas of physiotherapy.

Table 2. Physiotherapy and its benefits

Author	Benefits
Rodrigues, 2009	Combating hypotonia
Madeiro Júnior, 2018	Promoting motor development
Stefanes et al, 2021	Develop or improve balance
Da Cruz, 2020	Treating scoliosis and respiratory complications

4. CONCLUSION

Physiotherapy for patients with DS can improve the quality and life expectancy of these individuals, but the needs of patients with this syndrome involve some physical, physiological, and psychological aspects and require the attention of a multidisciplinary team. This study deals mainly with issues related to the exercise rehabilitation process, which is confirmed by the trend of academic research, and rarely involves other characteristics of the research, including respiratory, cardiovascular, and cognitive problems.

The lack of previously reported research on these topics indicates that researchers are not sufficiently interested in looking for new technologies and methods to treat these disorders. Another aspect that the study proved is that the focus of the study is in the early childhood or childhood of patients with DS, with the majority of studies focusing on these populations, with no study with the elderly, which may be different from other phases of the study. life Specific needs.

However, regarding the results related to the exercise rehabilitation process, there is evidence that regardless of the technique used (hydrodynamic therapy, hippotherapy, conventional physical therapy), multisensory exercise can significantly improve the rehabilitation process, but due to the new technology little research. Physiotherapy still uses techniques considered to be more conservative, including the Bobath and Kabat methods.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Leite JC, Neves, JCJ, Vitor LGV, Fujisawa DS. Postural control in children with down syndrome: Assessment of balance and functional mobility. Rev. Bras. Ed. Esp. 2018;24:173-182.
2. Oliveira CC. Effect of grip strength training and manual dexterity in children with down syndrome aged 5 to 10 years. Thesis. Doctorate. Federal University of São Carlos, São Carlos; 2018.
3. Costa VSF, Silva HM, Azêvedo M, Silva A R, Cabral LLP, Barros JF. Effect of hippotherapy in the global motor coordination in individuals with Down Syndrome. Fisioter. Mov. 2017;30:45-53.
4. Toble AM, Basso RP, Lacerda AC, Pereira K, Regueiro EMG. Hydrotherapy in the physiotherapeutic treatment of an infant with Down's Syndrome: a case study. Fisioter. Mov. 2013;26: 231-238.
5. Anbar JT, Féria AL, Pereira D, Gonzalez FC, Dutra RS. The acquisition of motor skills in children with Down Syndrome who undergo physical therapy or practice hippotherapy. Fisiot Mov. 2013;26:515-524.
6. Marinho FS. Physiotherapeutic intervention in the motor treatment of Down syndrome: a bibliographic review. Campo do Saber magazine. 2018;4:17-25.
7. Moraes KDW et al. Profile of physiotherapy intervention for Down syndrome children. Fisiot Mov. 2016;29:693-701.
8. Corrêa JCF et al. Can the existence of neurophysiological changes help to understand the role of hypotonia in the motor development of individuals with Down syndrome?. Fisiot and Pesq. 2011;18:377-381.
9. Priosti P. et al. Grip strength and manual dexterity in children with Down syndrome; 2009.
10. Coppede AC, et al. Fine motor performance and functionality in children with Down syndrome. Fisiot and Pesq. 2012;19:363-368.
11. Godzicki B, et al. Acquisition of independent sitting in Down's Syndrome using balance. Fisiot Mov. 2017;23:89-96.
12. Torquato JA et al. The acquisition of motor skills in children with Down Syndrome who undergo physical therapy or practice hippotherapy. Fisiot Mov. 2017;26:43-51.
13. Costa V S et al. Effect of hippotherapy in the global motor coordination in individuals with Down Syndrome. Fisiot Mov. 2017;30: 229-240.
14. Porto CMV, Ibiapina SR. Aquatic environment as an occupational therapy

- setting for the development of the body scheme in down syndrome. Brazilian Journal of Health Promotion. 2012;23(4): 389-394.
15. LIPP, Laura Kolberg; Martini, Fernanda de Oliveira; Oliveira-Menegotto, Lisiane Machado de. Development, schooling and Down syndrome: maternal expectations. Paidéia (Ribeirão Preto). 2010;20(47):371-379.
 16. Ribeiro CTM, Ribeiro MG, Araújo AP, Torres MN, Neves MAO. Profile of physical therapy care in Down's Syndrome in some institutions in the city of Rio de Janeiro. Revista Neurosciences. 2007;15(2):114-119.
 17. Nascimento LS. DOWN SYNDROME: physiotherapeutic approach and the family's contribution to motor development; 2012.
 18. Lemos ECDS. The importance of swimming in the motor development of children and young people with Down Syndrome: A literature review (Bachelor's thesis); 2018.
 19. Santos RRLD, Santos APFD. Evaluation of cardiorespiratory mechanics and functional capacity in patients with down syndrome; 2016.
 20. Como ajudar o bebê com Síndrome de Down a sentar e andar [Internet]. Online: Marcelle Pinheiro; 2021. Benefícios da fisioterapia na Síndrome de Down. [Cited 2021 Mar 21] Available:<https://www.tuasaude.com/fisioterapia-para-sindrome-de-down/>

© 2021 Silva et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

*The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/66592>*