



## Respiratory physiotherapy performance with children with Down Syndrome in home care

### Atuação da fisioterapia respiratória com crianças com Síndrome de Down na atenção domiciliar

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#### ABSTRACT

Down syndrome (DS) is a common and complex genetic condition whose effects can manifest in various physiological and behavioral aspects. The most observed effects are in the alterations of the child's motor and cognitive development in several aspects. Physiologically, respiratory problems are frequent in children with DS and can have several causes, including nasal obstruction, weak thoracic muscles, decreased diaphragm mobility and esophageal function. The objective of this study is to understand physical therapy in home care for children with down syndrome. The methodology used was a literature review research and the articles used were searched in the electronic databases: VHL, Scielo, PubMed, Lilacs and PEDro. According to the studies, home respiratory physiotherapy plays an essential role in the care of children with Down syndrome, reducing respiratory challenges and improving quality of life. This personalized approach not only treats lung problems but also educates caregivers, positively impacting the child's development.

**Keywords:** Physiotherapy, Down syndrome, Home treatment, Respiratory therapy, Children.

#### 1 INTRODUCTION

Down syndrome (DS) is a common and complex genetic condition whose effects can manifest in various physiological and behavioral aspects. The most observed effects are in the alterations of the child's motor and cognitive development in several aspects (Streda; Vasquez, 2022).

Alterations may be present such as difficulties in motor coordination and balance, such as walking and cycling, communication and language problems, including speech, learning and



academic learning difficulties, such as reading and writing, and developed social behaviors, such as interacting with other people and making friends (Dombroski; Souza, 2023).

The physical therapist can work with the child with DS in a variety of ways, including mobility therapy, which will involve adapting exercises to improve the child's strength and motor coordination, balance and coordination therapy, which may include balancing and coordination exercises with cushions and unstable surfaces, among others (Santos; Rêgo; Silva, 2022).

Physiologically, respiratory problems are frequent in children with DS and can have several causes, including nasal obstruction, weak thoracic muscles, decreased diaphragm mobility and esophageal function (Streda; Vasquez, 2022).

Treatment of Down syndrome focuses on minimizing the effects of respiratory problems and improving children's quality of life. To do this, it is important to involve a specialized healthcare professional, such as a respiratory physiotherapist, who can develop an individualized treatment plan (Freita *et al.*, 2023).

This syndrome can increase the risk of medical complications, such as heart problems, respiratory health problems, and a greater susceptibility to infections, even requiring more specific care at the child's home, the so-called Home Health Care (ADS) (Menezes *et al.*, 2022).

ADS is defined as medical care provided to a person in their own home, as an alternative to treatment in a hospital or other healthcare setting. Healthcare professionals involved in ADS may include doctors, nurses, physical therapists, social workers, and others. This home care allows the health professionals involved to provide more personalized care to the child, considering their specific needs (Lima *et al.*, 2022).

Physiotherapy plays a key role in promoting neuropsychomotor development, functionality, quality of life, and social inclusion of these children with down syndrome when applied in the home environment, contributing to a more comprehensive and family-centered approach (Bezerra *et al.*, 2023).

This research sought to fill a critical gap in the scientific literature by providing fundamental information on the clinical applicability of this technique in an often overlooked and vulnerable patient population. Through a rigorous and scientific approach, this study aims to contribute to the improvement of the management of more accessible home care for children with DS and respiratory diseases, which can significantly improve their quality of life and emotional well-being.

In view of the above, this study aimed to investigate the role of respiratory physiotherapy with children with down syndrome in home care, through an integrative literature review.



## 2 METHODOLOGY

This study is a bibliographic research of the integrative review type idealized as a course completion work, which identified, selected, analyzed and discussed bibliographic studies about the theme of the study, methodologically reviewing theories and practices of the theme in question.

This method of literature review is characterized by the systematic search for scientific evidence for the understanding of a given subject, assisting and synthesizing the actions employed in decision-making (Souza; Silva; Carvalho, 2010). This study followed the following 5-step protocol: 1) definition of the research problem, data sources, search strategies, and eligibility criteria; 2) search and selection in databases; 3) identification, extraction and organization of the selected sampling; 4) categorization, integration and critical evaluation of findings; and 5) analysis and discussion of the results.

The objective of the research was to include scientific publications that addressed the objective of the research, which had a full text and available, including at least one of the chosen descriptors, published from 2013 to 2023, in Portuguese, English and/or Spanish.

After the findings were identified, publications that fit the inclusion criteria, but that were duplicates, such as abstracts of presentations and conferences, errata, book chapters, encyclopedias, guidelines, short communications, complete books, press articles, texts from websites, opinion articles, editorials, intervention protocols, estimation studies, etc. letters to the editor, guidelines, technical documents, and government publications.

The data sources used were electronic databases and a search in the reference list of articles. The articles were searched in the electronic databases: VHL, Scielo, PubMed, Lilacs and PEDro, using the strategies to search for combinations of the following descriptors selected from the Health Sciences Descriptors (DECS) database: "Physiotherapy", "Down syndrome", "Home treatment", "Respiratory therapy", and "Children". The articles were read in full and their information was extracted and organized using the Prisma-P Guidelines 2020 (The PRISMA Statement, 2020), and then analyzed descriptively.

## 3 RESULTS AND DISCUSSION

In the initial phase of this study, the combined search of descriptors in databases resulted in 345 articles identified. Of these, 79 did not meet the inclusion criteria and were filtered, leaving 266 for analysis of the titles at screening. Figure I shows the systematization of the stages and their results.

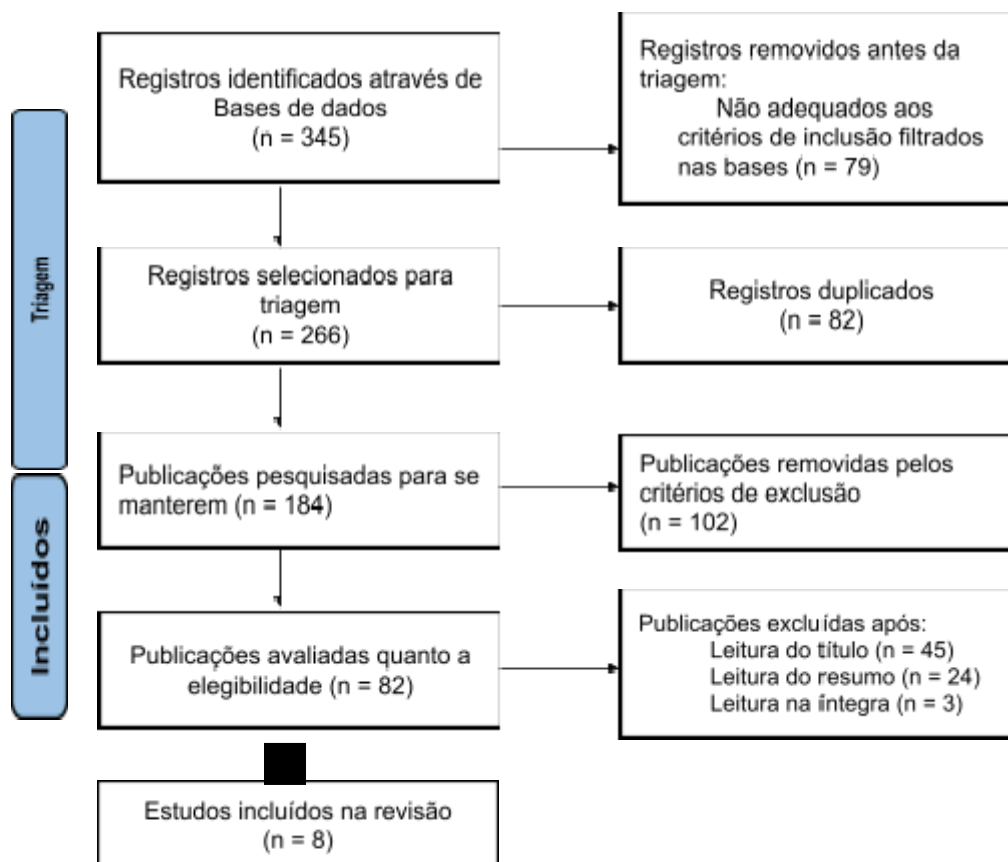
In the analysis of the titles, it was identified the presence of 82 duplicate articles between

the databases, which were removed. This resulted in 184 articles for the next phase of analysis, considering exclusion criteria, of which 102 were discarded. Moving on, 82 publications advanced to the complete reading of the titles, abstracts and texts, culminating in the selection of 8 articles aligned with the objectives of this study. The studies found cover the years from 2013 to 2023. The methodologies adopted vary, including integrative, narrative, qualitative review, case reports, interview studies, clinical trials, and efficacy analyses.

It is worth mentioning the limitation found in the availability of studies (n= ) on the subject and its specificity, demonstrating that it is still an incipient area in scientific research. The details of the selected articles are presented objectively in Chart 1, including information on authors, year of publication, objectives, type of study, and main results.

The research presented here sought to elucidate and gather bibliographic literature that presented the respiratory physiotherapy performance at home with children with DS, through the discussion between the authors selected in the databases and the scientific literature.

Figure 1 – Flowchart of the selection of studies included in the review



Source: Study data, 2023

In view of the critical analysis carried out, 2 categories of discussion emerged that will be discussed below, which were: 1) Concepts, applicability, challenges and perspectives of action; and 2) Conducts, techniques, protocols, and performance parameters.

Table 1 - Presentation of the characteristics and information of the studies in this review (continued).

Author(s) and year	Purpose of the study	Type of study	Main outcomes
Barroset Al. 2021	To verify the effects of virtual reality, through the Nintendo Wii console, on motor development, balance and respiratory muscle strength during physical therapy of a 12-year-old child diagnosed with DS.	Case report	In the post-intervention period, there was a concomitant improvement in motor development, fine motor skills and global mobility; expiratory muscle strength; speed, reaction time, and directional control in the participant's posterior body balance. Conclusion: The results presented in the present report support the use of virtual reality as a promising therapeutic option to be incorporated as an adjuvant in the physical therapy of children with DS.
Braga <i>et al.</i> , 2019	To analyze the effects of aquatic physical therapy on respiratory muscle strength in children and adolescents with Down syndrome.	Study of intervention quasi-experimental	It is highlighted in this study that aquatic physiotherapy seems to be an efficient therapeutic resource for strengthening the respiratory muscles and improving the vital signs of children and adolescents diagnosed with Down Syndrome.
Silva and Silva <i>et al.</i> , 2019	To evaluate the effectiveness of psychomotor training on the respiratory capacity of children diagnosed with Down syndrome.	Study of Cross-section	The results of this study suggest that training can influence respiratory muscle strength in patients with Down syndrome, of both sexes, when compared to individuals with Down syndrome who do not practice some type of exercise.
Santos, Santos and Nascimento, 2022	To know the physical therapy performance aimed at patients with DS through a literature review.	Narrative review	The study concluded that any physical therapy activity is of great value for the neuropsychomotor development of children with DS, especially when offered from the first years of life because it stimulates neural plasticity and helps to develop cognitive and psychomotor aspects that reflect on the acquisition of autonomy. However, the reported methods are technical because they approach human development in a fragmented way, disregarding the infinite diversity of factors that can interfere with physical therapy intervention and the intended and achieved results.
Rabelo and Carvalho, 2021	To analyze physiotherapy in the health of children with Down Syndrome, showing the benefits through the use of physiotherapy treatment.	Integrative review	It is visible that physical therapy resources are fundamental in the motor development of individuals with Down, and, quickly, parents should get out of denial and seek physical therapy help for greater development, better functionality and independence for the child, and many physical therapy treatments are found, however, it is necessary to consider the individuality of each child to choose what is most comfortable and best for him.
Almeida and Carvalho, 2021	To understand the physical therapy performance in the face of Down Syndrome.	Integrative review	The results found were positive, because the contributions of physiotherapy in Down Syndrome are efficient for motor development, and that each resource used will depend on how the child is. Therefore, it is concluded that physiotherapy is extremely important in the life of children with this syndrome, as it will positively contribute to their development, providing quality of life, autonomy and active participation in society.



Pereira <i>et al.</i> , 2019	Understand the main physiotherapeutic techniques used for the treatment of Down Syndrome (DS)	Narrative review	Physical therapy treatments aimed at DS patients can improve the quality and life expectancy of these individuals, however, the needs of patients with this syndrome involve several physical, physiological and psychological aspects, which demand attention from a multidisciplinary team. In this study, there was a tendency for research by the academic class on this topic, mainly the issues involving the motor rehabilitation process, with few studies addressing other characteristics, including respiratory, cardiovascular and cognitive issues.
Sgariboldi <i>et al.</i> , 2013	To evaluate the benefits of a Respiratory Physiotherapy (PFR) Program on respiratory muscle strength in individuals with Down Syndrome.	Intervention study	In view of the findings, it can be concluded that PFR promoted improvement in inspiratory muscle strength in individuals with DS, and may constitute a safe and effective therapy to be performed at home with the help of the family and also to be included in the treatment routines of the population studied.

Source: Study data, 2023.

### 3.1 CATEGORY 1 - CONCEPTS, APPLICABILITY, CHALLENGES AND PERSPECTIVES OF ACTION

Physiotherapists play a crucial role in offering in-home services for children, tailoring their treatment to the individual needs of patients. In a home environment, they have the opportunity to create a more comfortable and familiar environment for the children, facilitating the execution of therapeutic activities (Santos; Saints; Nascimento, 2022).

In addition, home intervention allows the physical therapist to better understand the child's life context, considering environmental and social factors that can influence their motor and functional development (Rabelo; Carvalho, 2021).

The work of the physiotherapist at home with children involves not only the application of therapeutic techniques, but also guidance and support to parents or caregivers. This includes instruction on exercises and activities that can be performed at home to strengthen the progress made during physical therapy sessions (Almeida; Carvalho, 2021). This collaborative approach between the professional and the family is essential to maximize treatment outcomes and integrate interventions into the child's daily routine. The individualization of treatment is one of the main benefits of physical therapy at home, since it allows the professional to adapt therapeutic activities according to the environment and resources available in the child's home (Santos; Saints; Nascimento, 2022).

This promotes a more holistic and patient-centered approach, taking into account their motor skills, specific challenges, and accessibility needs within their family environment (Rabelo; Carvalho, 2021).



The home environment offers a valuable opportunity to assess and intervene in situations of the child's daily life, such as self-care activities and mobility within the home. The direct observation of these situations by the physical therapist enables the identification of specific difficulties and the implementation of therapeutic strategies directed to these situations (Almeida; Carvalho, 2021).

The physiotherapist's work at home with children is a personalized and integrative approach that considers the child's individual needs, their family environment and promotes collaboration between professional, patient and family members to achieve better therapeutic results (Santos; Saints; Nascimento, 2022).

Physical therapists play a crucial role in developing and improving the quality of life of children with Down syndrome. They employ a holistic approach to help these children with motor, cognitive, and social progress (Rabelo; Carvalho, 2021).

Physical therapy intervention focuses on stimulating fundamental motor skills, such as coordination, balance, gait, and postural control, adapting specific techniques and exercises to the individual needs of each child (Almeida; Carvalho, 2021). Additionally, physical therapists work closely with other professionals, such as occupational therapists and speech pathologists, to create comprehensive intervention programs (Pereira *et al.*, 2019).

This multidisciplinary approach aims to promote a more balanced overall development and address specific issues that may arise, such as articulation problems, fine motor coordination, and communication difficulties (Rabelo; Carvalho, 2021).

Another important aspect of the physiotherapist's work is early stimulation, starting interventions from an early age. This allows the optimization of the child's developmental potential, facilitating the acquisition of basic motor skills and promoting functional independence over time (Almeida; Carvalho, 2021).

Physical therapists also focus on guiding parents and caregivers, providing strategies and exercises that can be incorporated into the daily routine to stimulate the child's motor and cognitive development. This direct collaboration helps to strengthen the progress achieved during physiotherapy sessions, promoting effective continuity in treatment (Pereira *et al.*, 2019).

The role of the physiotherapist with children with Down syndrome is crucial to promote motor development, functional independence and general well-being, through adapted interventions and an interdisciplinary approach. Physical therapy plays a significant role in supporting the development and improving the quality of life of children with Down syndrome, especially when applied in the home environment (Santos; Saints; Nascimento, 2022).



By offering in-home care, physical therapists have the opportunity to create a more familiar and comfortable environment, which often promotes greater interaction and adherence to treatment. In this context, physiotherapy sessions are tailored to address specific motor challenges faced by children with Down syndrome, aiming to improve motor coordination, balance, and muscle strength (Pereira *et al.*, 2019).

Individualization of treatment is essential in home care, allowing the physical therapist to adapt activities and exercises according to the needs and abilities of each child. The focus is not only on motor development, but also on promoting functional independence. Various therapeutic strategies are employed, ranging from early stimulation techniques to specific exercises to improve posture and mobility (Almeida; Carvalho, 2021).

In addition, physical therapy at home allows for greater integration with the family, enabling parents or guardians to actively participate in the therapeutic process. This not only strengthens the bond between parents and children, but also provides caregivers with practical tools to continue therapeutic support between professional sessions (Pereira *et al.*, 2019).

The approach to home-based physiotherapy for children with Down syndrome seeks not only motor development, but also social inclusion and autonomy. By adapting the home environment and providing practical strategies to deal with motor difficulties, physical therapy aims to improve the child's quality of life, promoting their full engagement in day-to-day activities and interaction with the world around them. It is a collaborative and continuous process, where adaptation and patience are essential to achieve the best results (Almeida; Carvalho, 2021).

Physiotherapy plays a key role in the care of children with Down syndrome, especially in the context of home care for respiratory problems. In this setting, the physical therapist can perform targeted interventions to improve lung function and help prevent respiratory complications often associated with the syndrome (Pereira *et al.*, 2019).

Through specialized techniques, such as breathing exercises, lung reexpansion maneuvers, and chest mobilization, the physical therapist aims to promote adequate pulmonary ventilation, facilitate the elimination of secretions, and strengthen the respiratory muscles (Santos; Santos; Nascimento, 2022).

Home care offers a significant advantage, allowing the intervention to be tailored to the individual needs of the child with Down syndrome. The family environment provides comfort and familiarity, reducing possible anxieties and facilitating the child's active participation in physiotherapy sessions (Santos; Santos; Nascimento, 2022).



Additionally, physical therapists can guide caregivers on techniques and exercises that can be continued between sessions, promoting continuity of care and maximizing long-term benefits (Pereira *et al.*, 2019).

It is important to emphasize that the physiotherapy approach for children with Down syndrome and respiratory problems in the home environment is not limited only to direct treatment (Almeida; Carvalho, 2021).

Physical therapists also play a crucial role in educating parents or guardians by providing information on warning signs, preventive measures, and strategies to optimize the child's respiratory health. This educational aspect is essential to enable the family to actively participate in the child's ongoing care (Pereira *et al.*, 2019).

In addition to improving respiratory function, home physical therapy sessions can contribute to the overall well-being of the child with Down syndrome. Close contact and interaction during sessions not only address respiratory problems, but also promote the child's motor, sensory, and emotional development (Silva and Silva *et al.*, 2019).

This holistic approach reinforces the importance of physical therapy not only as a treatment for a specific condition, but as a means of improving the quality of life of children and their families (Almeida; Carvalho, 2021).

This action is a multifaceted intervention that aims not only to treat respiratory issues, but also to offer emotional, educational, and developmental support, all adapted to the family environment to promote comprehensive and effective care (Pereira *et al.*, 2019).

Physical therapy plays a crucial role in this treatment, especially in the home setting, where respiratory challenges often manifest. Children with this condition may have physical characteristics, such as muscle hypotonia and changes in the anatomy of the airways, which contribute to respiratory problems (Santos; Santos; Nascimento, 2022).

The at-home physiotherapy approach to these issues involves the implementation of specific techniques, such as breathing exercises, chest mobilization, and guidance to caregivers on appropriate postures (Barros *et al.*, 2021).

However, the challenges lie in the need for continuous adaptation of therapeutic methods to the individual needs of each child, considering the varied spectrum of abilities and limitations presented by Down syndrome (Sgariboldi *et al.*, 2013).

Despite the challenges, the prospects for home-based physiotherapy for children with Down syndrome are promising. Acting in this context allows for a more personalized and integrated approach, favoring healthy respiratory development and improving quality of life



(Barros *et al.*, 2021).

In addition, early and continuous intervention can reduce respiratory complications, preventing recurrent lung infections and contributing to functional independence (Pereira *et al.*, 2019).

Constant monitoring and close collaboration between physiotherapists, families, and other health professionals are key to adapting therapeutic strategies, overcoming challenges, and offering comprehensive and effective care to children with Down syndrome, broadening their perspectives on health and well-being (Silva and Silva *et al.*, 2019).

### 3.2 CATEGORY 2 - CONDUCTS, TECHNIQUES, PROTOCOLS AND PERFORMANCE PARAMETERS

Parameters for breathing exercises include frequency, duration, and intensity. For example, deep breathing exercises can be performed in series, with a daily frequency set by the physical therapist, usually two to three times a day, lasting 5 to 10 minutes per session. Intensity can vary, starting with low levels of resistance to gradual adaptation to exercise (Barros *et al.*, 2021).

While performing the breathing exercises, the physical therapist closely monitors the child to ensure that he or she is performing the techniques correctly, without overexertion or discomfort. Observation of the adequacy of the child's breathing pattern, posture, and response is essential to adjust exercises as needed (Sgariboldi *et al.*, 2013).

The progression of breathing exercises is done gradually and adapted to the child's ability. As the child becomes more comfortable and skilled in breathing techniques, the intensity of the exercises can be increased, either by increasing the resistance in the devices or by prolonging the duration of the sessions (Braga *et al.*, 2019).

The inclusion of playful elements in breathing exercises can make the sessions more engaging for the child. Incorporating games, music, or stories during the exercises can motivate participation and make the process more enjoyable (Silva and Silva *et al.*, 2019).

It is essential to guide parents or caregivers on how to help the child practice these exercises at home, ensuring continuity and reinforcement of treatment. Clearly explaining the techniques and parameters to be followed is essential for the success of breathing exercises outside the clinical setting (Barros *et al.*, 2021).

Keeping a detailed record of breathing exercise sessions is important to track your child's progress. This includes information on exercise tolerance, possible improvements in respiratory function, and any difficulties faced during the sessions (Braga *et al.*, 2019).



Performing regular assessments of the child's respiratory function is essential to adjust the techniques and parameters of the exercises, adapting them according to the needs and evolution of the clinical picture, thus ensuring a personalized and effective approach (Sgariboldi *et al.*, 2013).

The application of deep breathing techniques aims to improve lung capacity and respiratory efficiency in children with Down syndrome. These techniques may involve deep inhalation through the nose followed by a slow exhalation through the mouth, emphasizing the use of the diaphragm (Silva e Silva *et al.*, 2019). The physiotherapist guides the child to inhale deeply, inflating the abdomen and expanding the rib cage to optimize the recruitment of respiratory muscles (Barros *et al.*, 2021).

Respiratory rate control is a strategy to promote an adequate breathing pattern. This can include rhythmic breathing exercises, where the child is instructed to maintain a regular rhythm of inhalation and exhalation. The technique aims to reduce shallow and rapid breathing by encouraging slower and deeper breathing to improve gas exchange in the lungs (Braga *et al.*, 2019).

Respiratory incentive devices, such as incentive spirometers, can be employed to strengthen the respiratory muscles. These devices consist of instruments that offer resistance during inhalation, encouraging the child to inhale more deeply against this resistance by strengthening the muscles involved in breathing. These can be tailored to the child's individual abilities to avoid excessive fatigue or discomfort (Sgariboldi *et al.*, 2013).

Bronchial hygiene is another key technique in home respiratory physiotherapy. This involves strategies to facilitate the removal of pulmonary secretions, aiming to keep the airways clear and prevent respiratory complications (Silva and Silva *et al.*, 2019).

Among the approaches used, postural drainage maneuvers stand out, which consist of positioning the child appropriately to favor the elimination of secretions, in addition to the use of percussion and thoracic vibration techniques to mobilize and facilitate expectoration (Barros *et al.*, 2021).

In specific cases where additional respiratory support is required, noninvasive ventilation (NIV) is employed. This method consists of the use of devices such as CPAP (Continuous Positive Airway Pressure), which provides continuous positive pressure in the airways, helping to keep the lungs open during breathing, facilitating airflow and adequate oxygenation (Braga *et al.*, 2019).

However, it is essential to emphasize that the application of these techniques at home requires adequate supervision and guidance by health professionals, especially specialized physical therapists (Silva and Silva *et al.*, 2019). A personalized approach tailored to the specific



needs of each child with Down syndrome is essential to ensure the efficacy and safety of these home-based respiratory interventions (Braga *et al.*, 2019).

Breathing exercises that involve the use of positive pressure devices play a significant role in home physical therapy for children with Down syndrome. Among these devices, CPAP (Continuous Positive Airway Pressure) is often employed to assist in keeping the airway open during breathing (Barros *et al.*, 2021).

This technique consists of applying continuous positive pressure, through a face mask, to help expand the lungs, facilitate gas exchange and improve oxygenation. CPAP therapy is individually adjusted, considering the child's age, specific respiratory needs, and possible clinical conditions associated with Down syndrome (Braga *et al.*, 2019).

When performing home respiratory physiotherapy with the use of CPAP, it is essential that the parameters are carefully monitored. The pressure levels applied should be adjusted by the physiotherapist according to the child's tolerance, avoiding excessive discomfort or respiratory complications (Sgariboldi *et al.*, 2013).

Additionally, proper face mask selection is crucial to ensure a comfortable and effective fit, maximizing adhesion and minimizing air leaks. The regularity and duration of CPAP use are determined according to the healthcare professional's prescription, usually during sleep periods to assist in the stabilization of the airways and the prevention of apneas or obstructive respiratory events (Barros *et al.*, 2021).

Therapy with positive pressure devices, such as CPAP, has advantages in improving oxygenation and reducing respiratory problems in children with Down syndrome. However, the success of this technique in the home environment depends on the collaboration of parents/caregivers, who are responsible for ensuring the correct application of the device and following the guidelines provided by the physical therapist (Braga *et al.*, 2019).

Regular follow-up by the health professional is essential for adjusting the parameters, evaluating the effectiveness of the treatment, and supporting families in the proper management of respiratory therapy at home (Barros *et al.*, 2021).

#### **4 FINAL THOUGHTS**

Home respiratory physiotherapy plays an essential role in caring for children with Down syndrome, reducing breathing challenges and improving quality of life. This personalized approach not only treats lung problems but also educates caregivers, positively impacting the child's development.



Using techniques such as breathing exercises and positive pressure devices such as CPAP, physical therapy aims to expand the lungs, facilitate the expectoration of secretions, and improve oxygenation. Careful monitoring of parameters, adjusting pressure and ensuring adherence results in benefits such as reduced respiratory complications and a healthier life for children with Down syndrome.

Future research should focus on specific protocols, family adherence, long-term effects of therapies and their impact on the overall development of these children, strengthening the evidence and clinical practice in this area.



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