

(REVIEW ARTICLE)



## The effectiveness of physical therapy intervention on the quality of life in obese children and adolescents

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### Abstract

**Introduction:** Physical inactivity and a sedentary lifestyle are directly linked to childhood obesity. Bad eating habits and genetic predisposition are possible factors related to its appearance. Childhood obesity has tripled in the last 3 decades. More than 340 million children worldwide are categorized as overweight or obese. Childhood obesity can affect the self-esteem of young obese individuals and lead to long-term serious psychological and social consequences.

**Purpose:** The purpose of this bibliographical review is to highlight the physical therapy intervention in the quality of life in obese children and adolescents and its interaction with other therapeutic interventions.

**Methodology:** The search was done in MEDLINE / Pubmed, Cochrane, Embase, Scopus

Studies had to be clinical studies and refer to quality of life and the use of physical therapy in obese children and adolescents. Based on the above criteria, 18 articles emerged and after applying the selection criteria, 4 articles were selected.

**Discussion – Conclusion:** Physical therapy with therapeutic exercise programs can be a key factor in improving the respiratory function and quality of life of people suffering from obesity. Physical therapists currently provide little input into the management of children who are overweight or obese, despite having a skill set appropriate for working with this population. Physiotherapy helps to support the mobility of obese children by increasing their physical health and quality of life. There is little detail about how to get obese children "physically active" in a way that is appropriate for their development and ability.

**Keywords:** Physical therapy intervention; Pediatric obesity; Quality of life; Children

### 1. Introduction

Obesity is an abnormal condition and exists in the pediatric population when the body mass index is above the 95th percentile for age and sex (Hansen et al., 2016). The World Health Organization (WHO) defines obesity as the excessive accumulation of fat in the body and warns that both obesity and excess weight endanger health since they are associated with the manifestation of diseases and psychosocial problems. We call a child overweight only in the event that his body proportions are not the desired ones, which means that the weight is greater than the standard for his height, while the term obesity refers to the phenomenon of having excessive accumulated fat in the body.

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Obesity is a major global public health problem in children, adolescents and adults. In 2013, 42 million preschool children (children under the age of 5) were overweight or obese (World Health Organization 2000). There are two forms of obesity, hyperplastic and hypertrophic obesity. With the term hypertrophic obesity, we refer to the form where there is an increase in the size of fat cells, while in the second form we have an increase in the number of fat cells. During childhood it is very important to know that there is an increase in the number of fat cells, while in adulthood fat cells only increase in size. Thus, childhood obesity which is of the hyperplastic type has serious consequences, as children are doomed to become obese adults in the future. This is a serious pathological condition, so every possible effort must be made to improve prevention and treatment.

Obesity during childhood and adolescence has a significant impact on both physical and mental health. Physical inactivity, a sedentary lifestyle is directly linked to childhood obesity. Bad eating habits and genetic predisposition are possible factors related to obesity in children and adolescents. The underlying causes of obesity remain somewhat controversial. Current health recommendations for obesity management are based on the underlying physiological property that fat accumulation is due to an energy imbalance between calories in and calories out.

Childhood obesity is involved in psychological and social consequences, that is, it can affect the self-esteem of young obese individuals and can lead to psychological consequences in the long term (Poeta et al., 2013). Many studies indicate that primary care providers are generally at the forefront of treating psychiatric disorders that may be associated with obesity and are encouraged to be part of an interprofessional team to facilitate appropriate referrals (Rocchini, 2004). They also prioritize weight-friendly infrastructure, use unbiased language, and beyond that may encourage a spirit of empathy. Of particular interest, however, is the utilization of physical therapy for the management of obesity.

Today over a quarter of all adults are obese and another 35% are overweight. Children are not much better because childhood obesity has tripled in the last three decades. Obesity in childhood and adolescence is of particular concern since it has been associated with increased cardiovascular mortality and morbidity in adulthood. According to Truong, Park, Tsiros & Milne (2021), over 340 million children worldwide have been categorized as overweight or obese. In our country, the problem of adolescent obesity is higher compared to other countries. The need to increase physical exercise and reduce sedentary activities in this population is imperative.

### **1.1 Problems that appear in children with obesity and apply to physical therapy**

Obese children show more problems mainly in the cardiorespiratory, musculoskeletal system, compared to their peers with a normal body weight. Poor quality of life is closely related to obesity, especially in children. Cardiorespiratory effects when combined with musculoskeletal effects can exacerbate symptoms (Martin et al., 2013). They have a significant respiratory limitation, obvious obstruction of the small airways, a deficit in the respiratory muscles as well as in their coordination. They show back pain and other chronic musculoskeletal conditions such as arthritis.

Also observed:

- Increased resistance in the airways (El-Baz et al., 2009, Poeta et al., 2013),
- Higher incidence of obstructive sleep apnea syndrome (Narag I, Mathew JL, 2012),
- Occurrence of alveolar hypoventilation associated with a severe decrease in oxygen saturation (Verhulst SL, Schrauwen N, 2007,
- Higher frequency of bronchial asthma (Papoutsakis C., Priftis KN, 2013),
- Reduced mobility,
- Joint pain and especially of the spine and lower limbs,
- Distortions (Pomeratz W), timmnl, 2010, Chan G, Chen CT, 2009),
- Negative correlation between muscular fitness in childhood/adolescence and parameters of obesity and cardiometabolism in later life, together with a positive correlation for bone health (García-Hermoso, 2019).

Children and adolescents with obesity are at high risk of transitioning to adult obesity, leading to a range of serious health problems (Young-Gyun Seo et al., 2019). Loss of excess fat appears to contribute to better airway responsiveness compared to administration of bronchodilators (El-Baz et al., 2009; Deane & Thomson, 2006).

Also, physical therapy with therapeutic exercise programs can be a key factor in improving the respiratory function and quality of life of people suffering from obesity (Bjarni Kristinn Gunnarsson, et al., 2016, Guzmán-Muñoz et al., 2019) . The general trend for physical therapy engagement with obese children seems to favor it.

## **1.2 The role of physical therapy**

Physiotherapists, being the most qualified as experts in both kinesiology and pathology, can play an important role in its prevention and treatment (Martin et al., 2013). This is achieved by individualized management of the child's functioning and generalized difficulty in daily activities, as well as by promoting factors that enhance movement and reduce sedentary lifestyles (Martin et al., 2013). Physiotherapy according to the needs of each child activates the child with the application of therapeutic exercise programs and pushes him to be active, to participate actively in social requirements, in school sports and also to play more with his friends. Quality of life improves and psychological problems (poor self-esteem) are effectively reduced. A commonly accepted definition for quality of life does not exist to date due to disagreements arising between different sciences, humanities, social and health sciences (Walton, 2001), which approach the term quality of life from a different perspective and each of them gives the trial the approach. The concept of quality of life also includes economic dimensions and concerns economic sciences. The child who receives almost a lifetime of abuse about his body weight uses food intake as a defense mechanism to cope with his psychological disorders such as depressive and anxiety disorders (CDC 2009b).

Therefore, physical therapists are ideally suited to address the physical and psychological complications of obesity (CPA, 2007). Physical therapists provide valuable information and expertise in the multidisciplinary management of obesity (O'Connell, 2012) helping to optimize clinical outcomes and patient experience.

While the importance of physical activity is well recognised, in reality patients often find it difficult. It is important to facilitate an increase in physical activity in patients to the right level, which can be achieved by referral to a physical therapist (Wiklund et al., 2011). An assessment and treatment plan by a physical therapist will help overcome barriers to exercise (CPA, 2007). Physiotherapy covers the whole range of pathologies that appear in obese children and adolescents. But there are few details about how to get obese children "physically active" in a way that is appropriate for their development and ability.

## **1.3 Evaluation**

The history taking performed by the physical therapists is done in order to identify the diseases of the past and the pathological conditions of the present. In the case of a respiratory disease, in addition to obesity, the physical therapist must take it into account both in the design and in the conduct of his intervention, adjusting the exercises according to the respiratory symptoms (Hansen et al., 2016).

Assessment and monitoring of physical condition and physical activity in obese children is performed by physical therapists who have knowledge of pathology, pharmacotherapy and exercise physiology. Looking at the overall health of the child, the assessment of body posture should be a key element as it is a good predictor of current and future musculoskeletal health (Hristara et al., 2014).

In the literature, "healthy posture" is defined as the state of muscular and skeletal balance that protects the body's supporting structures from injury or progressive deformation. The most common deformities encountered in children with obesity are clubbed knees and flat feet, head and shoulders in a prolonged position, thoracic kyphosis and lumbar hyperlordosis. The evaluation should be based not only on the education of the correct body posture of the obese child, but also on the effort to prevent deformation at all levels of the developing skeleton.

Recently, a study by Macalczyk-Paprocka et al., (2017), showed that 74% of children with excessive BMI had transient and correctable deformities caused by poor posture or pain. Overweight or obese children are 1.5 times more likely to develop poor posture than normal weight children.

## **1.4 Cooperation with parents**

The modern way of life and survival affects the eating habits of all ages. However, a child mainly adopts the prevailing family habits. About 12,000 hours a year children up to the age of 17 spend a lot of time watching TV. Television viewing has been indirectly associated with childhood obesity in several epidemiological studies. In addition to the indirect correlations of television and the family eating model, children's nutrition is directly influenced by MMEs as based on these children develop opinions about what healthy eating is and even wrong opinions that they have adopted and accepted as correct.

Therefore, television also acts as an indicator of fundamental differences in children's eating habits, they have been integrated as a normal part of their eating culture. The school and the parents with proper instructions and advice can bring about positive results and are the only ones who can intervene immediately. The collaboration between physical

therapists and parents is a given in dealing with childhood obesity. Parents are actively involved in treatment programs. Feedback on health parameters is provided so that they realize that therapeutic exercises improve general health independent of changes in body weight (Hansen et al., 2016). The involvement of parents and friends helps to increase the frequency, duration and adherence to the treatment program. It is necessary to include fun and recreational activities in the session for the reasons mentioned above. Obese children are urged to increase physical activities outdoors and decrease those that require prolonged sitting (Hansen et al., 2016). Physiotherapists were cited as most responsible for educating parents in such situations (Schlessman et al., 2011).

### **1.5 Patient education**

One of the primary roles of the physical therapist when it comes to obesity is patient education. Many people continue to falsely believe that they can lose weight without making any effort or changing their sedentary lifestyle (Bird, 1992).

Physiotherapists need to help them understand that this is not true, because if the patient does not understand why this is wrong, they will continue to believe this, without seeing improvement in their obesity issue. When a physical therapist encounters an overweight patient who cannot perform the exercises required for treatment, they should sensitively express their concern about their body weight.

The physiotherapist with special therapeutic programs will prepare and activate obese children and teenagers to participate in a variety of sports such as tennis, football, basketball, gymnastics, martial arts, track and field sports and which over time of years will become an integral part of their lives (Hristara et al., 2014).

### **1.6 Purpose**

The purpose of this bibliographical review is to highlight the physical therapy intervention in the quality of life in obese children and adolescents and its interaction with other therapeutic interventions, as obesity hides a certain way of life, a certain ideology, which if not changed cannot be maintained the effects of loss.

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## **2. Methodology**

The search for scientific documents and analyzes was based on the use of special scientific terminology, related to the subject under study. The search was done in PubMed and MEDLINE/Pubmed, Cochrane, Embase, Scopus with keywords in the title and abstract "physical therapy intervention", "pediatric obesity", and "quality of life", "children", "adolescents".

### **2.1 Selection Criteria**

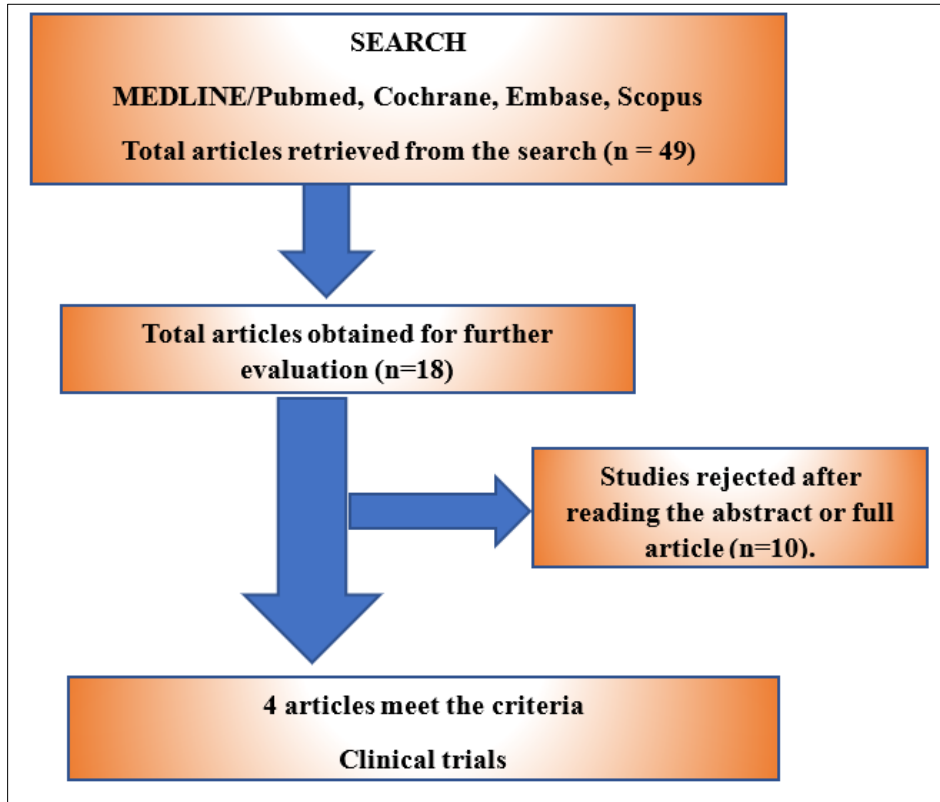
The selection criteria were:

- The studies must be clinical studies,
- Refer to obese children and adolescents,
- To refer to the quality of life of obese children and adolescents,
- Mention the use of physical therapy and exercise.

### **2.2 Exclusion criteria**

- All articles that did not meet the above criteria were excluded.

Based on the above criteria, 18 articles emerged and after applying the selection criteria, 4 articles were selected. The search strategy is then detailed in the study selection flow chart (Fig.1).



**Figure 1** Flow Chart

### 2.3 Research studies

Malecka & Mazur (2006), in their research, state that the basic approach to childhood obesity is based on lifestyle change. Namely, changing eating habits and increasing physical activity. With regard to physical activity, it is emphasized that the exercise to be applied should be targeted and not exceed the capabilities of the patient/child. Discipline and systematic exercise should be an integral part of the intervention to combat childhood obesity. But the biggest benefits are seen in the improvement of many quality of life parameters, such as:

- The quality of sleep,
- Psychology and
- The increase in endorphin production during exercise (malecka-tendera & mazur, 2006).

Guzman-Munoz et al., (2020), in their research wanted to measure differences in neuromuscular control and balance in obese and overweight elementary school children. It is very interesting to compare the physical exercise provided by a physical education teacher and that provided by a specialized physical therapist. Postural control is a very important area for improvement in these children. The control of posture and movement in space is a complex motor skill that requires the smooth interaction of many systems together (somatosensory, vestibular, visual) and neuromuscular responses. It is also argued that somatosensory-proprioception is the number one factor affecting bipedal support in children from 7 to 11 years old.

32 children, from 7 to 9 years old, took part in the research, who were divided into two groups. The training group, neuromuscular control group consisting of 16 children and the control group consisting of the remaining 16. Measurements for postural control were made on a balance platform. All participants took part in postural control measurements (bipedal support, eyes open and eyes closed).

The neuromuscular control exercise program included warm-up exercises (5'), muscle strengthening and coordination exercises for the lower limbs. Also, exercises to improve postural balance (one-legged support, on-site walking, coordination exercises for the lower limbs and one-legged sitting). Finally, the escalation of exercises for postural control and balance was done by changing from open to closed eyes. The duration of the intervention was 20 minutes at a time, for 2 times/week, for at least 4 weeks.

As a result, the measurements showed that the exercises to improve neuromuscular control contribute positively to the functional deficits that may appear in children with obesity, to improve their motor control and motor skills.

Horsak et al., (2019), in their research highlight the detrimental effects of obesity on the biomechanics of walking, such as increased risk of developing non-standard walking patterns, poor alignment of the lower limbs, knee valgus, increased step width, musculoskeletal alterations, pain and reduced physical activity. It has been observed that obese children are able to develop compensations in their gait so that they can maintain similar movement patterns in the sagittal plane, but cannot compensate for the changes (occurring) in the frontal. Also, they cannot compensate for further musculoskeletal changes, resulting in reduced muscle activity due to pain and discomfort. Particular emphasis is placed on the importance of physical exercise, weight loss, and strengthening of the knee extensors and hip abductors in order to achieve better control and alignment during dynamic loading of the lower extremity. The research involved 51 obese children (26 children in the intervention group, 25 control group), from 10 to 18 years old.

The program included 60 minutes of progressive difficulty exercise, 2 times/week, for 12 weeks. It also included warm-up exercises, strengthening the knee and hip muscles, as well as neuromuscular control exercises in the lower limbs and trunk. The results showed that therapeutic exercise programs can help in the progressive neutralization of biomechanical deformities of the lower limbs in obese children.

Celestine et al., (2019), in their research investigated the effects of an aerobic exercise program versus a sedentary program, in relation to the psychological factors of overweight children. They argue that overweight children are at risk of having a poor quality of life (QOL), depression, reduced self-esteem and behavioral problems. Exercise programs for children have been shown to improve mood and self-esteem. Few studies have used a condition control condition, inferences from quality of life (QOL) questionnaires or reassessment (follow up) after the research has ended. 175 overweight children aged 9-10 took part in their research (73% obese). Children were randomized to an aerobic or sedentary program after school for 8 months. After the intervention, quality of life, depression and self-esteem improved. No time or gender-by-time interaction on quality of life or self-esteem was examined in any group. Boys' depressive symptoms improved more and anger control decreased in the sedentary group compared to the exercise group after the intervention.

Exercise showed advantages in quality of life, symptoms of depression and self-esteem, compared to the sedentary program. Sedentary programs with games and art activities, interaction with adults and peers, and behavioral structure for boys' mood may be more beneficial than exercise.

This review involved a small number of articles and studies. The search on the aforementioned platforms highlighted the incomplete existing research and by extension the weak connection of childhood obesity with pediatric physical therapy. It is imperative to carry out both in the Greek and the International Scientific field, research that will take into account larger samples and that will highlight the effectiveness or not of pediatric physical therapy, while providing appropriate guidelines to professional physical therapists.

From the above clinical studies, it is concluded that physical therapy and therapeutic exercise can improve the quality of life and the psychology of obese children and adolescents. Finally, it will be a great achievement and contribution to the work of physiotherapists, if their role in pediatric physiotherapy becomes more widely known, as it seems that most ignore the provision of services to children with obesity as their professional capacity. The relevant information will lead to a better identification of the problem.

Increasing physical activity leads to a higher normal cardiorespiratory capacity. Therapeutic exercises show great improvement in self-esteem, reduction of anger, reduction of depressive symptoms and socialization and quality of life (Celestine et al., 2019, Guzmán-Muñoz et al., 2019).

There is a need for experienced pediatric professionals to practice developmentally appropriate physical activities aimed at ameliorating children's unique physical and psychological needs (Faigenbaum et al., 2013).

Few studies have used a condition control condition, inferences from quality of life (QOL) questionnaires or reassessment (follow up) after the research has ended (Celestine et al., 2019).

Collaboration between physical therapists and parents is a given in dealing with childhood obesity, parents are actively involved in treatment programs and feedback is provided (Hansen et al., 2016).

### 3. Discussion

Obesity increases lifetime risk of morbidity and mortality as well as societal costs. This results in it being one of the biggest health challenges in the modern world (Johansson et al., 2019).

Moderate exercise intensity is the most appropriate form of intervention to improve both physical condition and cardiometabolic factors affected in obese children and adolescents (García-Hermoso et al., 2019, Seo et al., 2019).

Therapeutic exercises show great improvement in self-esteem, reduction of anger, reduction of depressive symptoms and socialization. The increase in physical activity leads to a higher normal cardiorespiratory capacity (Celestine F. et al., 2019, Guzmán-Muñoz et al., 2019) resulting in an increase in mood and well-being. The fragile psychology and pathology that may accompany these children make it necessary to implement a strictly defined, individualized and directed program to improve all those factors/compensations that reduce participation in physical activity, resulting in a succession of complications and compensations.

Systematic interventions create positive changes in self-esteem by improving external appearance, increasing participation in fun activities and increasing sociability.

Also, physical therapy with therapeutic exercise programs can be a key factor in improving the respiratory function and quality of life of people suffering from obesity (Bjarni Kristinn Gunnarsson, et al., 2016, Guzmán-Muñoz et al., 2019).

Several studies support the need for experienced pediatric professionals to practice developmentally appropriate physical activities and emphasize the unique physical and psychological needs of children (Faigenbaum et al., 2013; Guzmán-Muñoz et al., 2019). The combination of therapeutic exercise programs with dance (dance therapy) has been shown to provide greater efficacy than the traditional form of exercise as well as to transform the psychological state of obese children and adolescents (Viana and De Lira., 2020). Physical therapists are ideally best suited to implement such programs, however the field of pediatric physical therapy itself should determine the need for the creation of a branch that will specifically deal with childhood obesity (Milne N, Choy NL, 2016). Physical therapists are uniquely positioned to facilitate the physical activity required for weight management in these patients because of their expertise in a number of related areas. Obesity needs multidisciplinary monitoring and its unwanted effects can be treated with therapeutic exercise programs to improve motor control and motor skills and by promoting those factors that enhance movement and reduce sedentary lifestyle (Guzmán-Muñoz et al., 2019, Martin et al., 2013). Despite targeted global efforts to address childhood overweight/obesity, it remains poorly understood and difficult to treat. Physiotherapists are able to manage children with obesity as they are experts in movement and physical activity. However, their role remains unclear due to a lack of specific guidelines for physiotherapy (Kim Truong et al., 2021). Physical therapists currently provide little input into the management of children who are overweight or obese, despite having a skill set appropriate for working with this population. Although physical therapy is not a traditional means of weight loss, physical therapy is not a traditional means of weight loss, it must be a new way to achieve this goal, while being responsible and addressing any musculoskeletal issues and co-morbidities, thus offering a way of prevention as well as treatment for the problems caused by obesity (Hill & Wyatt, 2005).

#### *Suggestions*

Based on the systematic review it is recommended that:

- Further clinical trials to determine the type of intervention according to age, abilities and personality profile, so that physiotherapists are able to proceed with the implementation of the most appropriate and individualized intervention programs.
- Systematic implementation of an individualized and structured therapeutic program, which is designed and supervised by the physical therapist.
- Providing personalized lifestyle advice, taking into account individual attitudes, beliefs, circumstances, cultural and social preferences and readiness for change.

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### 4. Conclusion

In conclusion, obesity is a global phenomenon which, considering the data, is spreading threateningly. For this reason, it needs immediate treatment. Physiotherapists should specialize in issues related to obesity in children and adolescents, as with the knowledge they have, they are able to design the appropriate therapeutic exercise program that

will make these people active. The combination of these programs with other alternative forms of treatment such as dance therapy, play therapy, music therapy, auditory neuromodulation, will activate them and change the quality of life for the better.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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