v. 5, n. 2, 2025

International Journal of Health Science

Acceptance date: 07/01/2025

MOTOR PHYSIOTHERAPY AT TEA

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Abstract: Autism spectrum disorder (ASD) is an alteration in the neuropsychomotor system that causes motor, sensory, cognitive and social changes**. Objective**: The aim of this research is to discuss autism spectrum disorder, confirming the contribution of motor physiotherapy in the treatment and/or rehabilitation of autistic children and listing the main types of motor impairment present in autistic children, seeking to highlight the importance of physiotherapy in the treatment of motor deficits. **Methodology**: This is a descriptive and explanatory bibliographical review; the Scielo, Lilacs and Google Scholar databases were used for the research. **Results**: ASD can cause deficits in functionality, cognition, skills, among several others, and consequently impacts on quality of life. Physiotherapy has positive evidence in the rehabilitation of autistic people. **Conclusion**: Physiotherapy plays an important role in the development of autistic people, acting on postural control, balance, skills, functionality, fine and gross motor skills, among other areas.
Keywords: ASD; Autism; Physiotherapy; Motor impairment; Motor physiotherapy.

INTRODUCTION

Autism Spectrum Disorder (ASD) is characterized by alterations in the neuropsychomotor and sensory systems, thus causing developmental alterations, presented from the first months of life and often observed from the age of two. In the disorder, the child development milestones considered ideal for the chronological age presented are not reached or are reached at a divergent age, and multidisciplinary monitoring is important to stimulate the child and minimize the deficits presented (American Psychiatric Association, 2014).

Autistic children can have motor, sensory, cognitive and intellectual deficits. These impairments can affect social interaction, learning, understanding, adaptation to different environments, and have an impact on functional independence. Early physiotherapeutic intervention is important for the child's adaptation and inclusion in the social environment. The approaches used are playful, for interaction and to obtain positive results during development (Santos et al., 2022).

Early diagnosis is of the utmost importance if there are to be better responses to the therapies used in the intervention. However, difficulties in completing the diagnosis mean that intervention takes a long time, thus compromising treatment and therapeutic approaches (Zanon; Backes; Bosa, 2014).

Children who start treatment early get better results because of neuroplasticity, i.e. the brain's ability to create new connections and adapt. This brain adaptation is more intense at a young age, making therapy more successful (Gaiato, 2022).

Stereotypies are repetitive and involuntary movements carried out unconsciously and usually happen when the child is not totally comfortable and deregulation occurs; physiotherapy helps and seeks to intervene with playful and interactive resources and techniques (Vargas, 2022).

The general objective of this study is to highlight the importance of physiotherapeutic treatment and the evidence of results in children with ASD, and the specific objectives are to describe the main impairments and report the stereotypes that impact on daily life.

METHODOLOGY

This is an explanatory and descriptive literature review, which seeks to identify the factors that influence motor physiotherapy in ASD. Searches were carried out in the Scielo, Lilacs and Google Scholar databases, using the descriptors "autism", "physiotherapy", "ASD", "motor impairment" and "motor physiotherapy".

The inclusion criteria were studies that addressed the topic and were published in Portuguese within the time limit of 2014 to 2024. The exclusion criteria were works whose time limit exceeded 10 years of publication, which addressed motor physiotherapy in other neurodevelopmental disorders and were in a foreign language. 40 articles were found and 32 were used. A total of 40 articles were found and 32 were used. In view of this, the aim is to address motor physiotherapy in children with ASD.

THEORETICAL BACKGROUND

TEA

Autism spectrum disorder (ASD) is developmental delay, considered ideal for the child's chronological age, affecting neurological, behavioral, cognitive, sensory and emotional aspects. Manifestations usually appear in the first few months of life, and in the majority of cases are observed in the first 24 months of the child's life. Possible risk factors include advanced parental age, low birth weight, genetic issues, among others (American Psychiatric Association, 2014).

Autistic children often have difficulties with verbal and non-verbal language, repetitive behaviors, hyperfocus, hypersensitivity, intellectual changes, stress and anxiety, and impaired balance and coordination. However, each individual has their own uniqueness, i.e. each child has a different pattern (Gaiato; Teixeira, 2018).

Autism has an impact on various areas of the neuropsychomotor and sensory system, causing alterations in development. The ability to locate oneself spatially, to understand verbal or non-verbal commands, to adapt to different environments, communication, perception, planning and execution of actions, motor and intellectual learning, motor coordination, balance, tone and postural control are some of the deficits. Individuals with ASD also have difficulties changing focus or socializing (Mendonça et al., 2020).

ASD has three levels of support which are classified according to the patterns found and the degree of independence; the lower the independence, the greater the support. Each level of support has its own distinct characteristics (Araújo et al., 2022).

At level 1, the individual shows difficulties in social interaction, changes in activities and behavior. Level 2 shows greater deficits in social interaction, marked stereotyping, resistance to change and more reserved behavior. Level 3, on the other hand, presents severe deficits in social interactions, impaired verbal or non-verbal communication, more emphatic behaviors and stereotypes, greater hyperfocus (American Psychiatric Association, 2014).

The diagnosis of ASD is made clinically, without the need for imaging or clinical tests. The doctor carries out an assessment of the child's development, following the milestones of child development, which combined with the report of the guardians and - if the child already attends school - the information given by the teachers, establishes the diagnosis (Gaiato; Teixeira, 2018).

Aimed at the needs and support levels of the child with ASD, therapeutic intervention- with the support of the multi-professional team - will collaborate with the treatment plan, aiming to include this child in the social environment (Benitez; Domenico, 2018).

MOTOR PHYSIOTHERAPY IN TEA

Physiotherapeutic intervention is extremely important for the development of children with ASD; the social, family and school environment in which the child will be inserted is first glimpsed, and then the treatment plan is drawn up. Playful and interactive resources are used, with the aim of achieving motor and cognitive results, as well as social

interaction for the improvement and effective inclusion of the child (SANTOS et al., 2022).

Most of the time, children with ASD have difficulty understanding their bodies, which ends up causing motor, cognitive and sensory impairments. The applicability of early physiotherapeutic treatment has the function of stimulating the body and mind, setting achievable therapeutic goals, which make it possible to experience daily life in a lighter and safer way (Silva; Vilarinho, 2022).

Further corroborating the aforementioned authors, it is confirmed that the physiotherapy approach plays a crucial role in motor skills - balance, coordination, body and/or postural control - reducing and/or altering stereotypes. A range of playful resources are used that enable positive and significant results that promote global stimulation and relaxation, helping with functional independence (Gaia; Freitas, 2022).

The physiotherapist is responsible for drawing up an effective therapeutic plan, based on the real needs of each child, and can work on both fine and gross motor skills, as well as relational skills. Therapeutic techniques can include physical exercises, games and activities involving verbal communication. Achieving positive results is based on and highly interconnected with the support of the children's guardians (Rocha; Raimundo, 2024).

Once a diagnosis of ASD has been made, it is checked whether the child needs to be referred for multidisciplinary care, which can include speech therapists, occupational therapists, physiotherapists, psychologists, neuropediatricians, among others, with the aim - a priori - of gathering information about the deficits and skills presented. It is worth noting that, for a more complete and efficient treatment, multidisciplinary discussion of cases is necessary, associated with the report of those responsible (Ferreira et al., 2016).

During the assessment, it is important to consider, in addition to motor and sensory issues, fine and broad motor skills, balance, coordination, body and postural control, gait, ADM, body awareness, protective reactions, interests, skills, functionality and independence. Each child's individual abilities will be worked on (Santana, 2021).

Also according to Santana (2021), muscle strength, tone, fine and broad motor coordination, gait, balance, posture, sense of space and time, fine/ broad/ relational psychomotricity are worked on, with playfulness using music, balls, hula hoops, swings, among others.

There are various techniques and resources such as kinesiotherapy, manual therapy, hydrotherapy, sensory activities and play activities. Therapeutic games such as gamete therapy and educational toys help to stimulate sensory and motor skills, concentration, coordination and memory. The therapeutic protocol should take into account the child's chronological and motor age, identifying their needs (Ferreira et al., 2016; Santana, 2021).

Equine therapy can also be used; contact with the animal encourages postural control, balance, physical contact, socialization, confidence and sensory stimuli; the Bobath technique will help with body control, tone, balance, protective reaction and motor development. Psychomotricity is applied to gain coordination, build or improve skills, balance, posture and tone; hydrotherapy, in addition to motor issues, is beneficial for emotional, social and behavioral development; kinesiotherapy works on strengthening, balance, coordination, gait, agility and sensory aspects (Santos et al., 2022).

Knowing that each autistic child has a different pattern, a specific assessment and intervention for each one is essential. It is also essential to emphasize that early diagnosis and intervention have an impact on treatment/ rehabilitation, promoting better results (Soares; Guimarães, 2024).

MOTOR IMPAIRMENTS IN TEA

ASD affects the neuropsychomotor system, delaying the usual gradual skills of childhood such as walking, talking and recognizing people. Thus, in children with ASD, this ability does not occur at the recommended age, making them dependent on family support to carry out their daily activities (Santos, Mascarenhas; Oliveira, 2021).

Motor and cognitive development work together to organize the body. This balance - between the two systems - is impaired in ASD, causing cognitive, social and motor deficits that affect independence, communication, socialization, behaviour, the performance of activities of daily living, school performance, among other areas (Santana, 2021).

Motor control is the mechanism that regulates body movement. Body balance is the responsibility of postural control associated with the nervous, sensory and motor systems and plays an essential role in the child's development. Balance can be dynamic (the ability to maintain balance during successive changes of position) or static (the ability to maintain balance in a given position) (Vidal et al., 2021).

Children with ASD have some motor impairments such as reduced body balance, difficulty walking, reduced muscle strength, difficulty in defining laterality, altered proprioception, difficulty in motor planning and hypotonia; these impairments interfere with movements, skills and body control (Nunes et al., 2023).

They may also exhibit repetitive and stereotyped motor behaviors that interfere with their daily abilities. Balance is one of the impairments that most affect psychomotor development, bringing instability and insecurity to autistic people, and physiotherapy uses techniques and approaches that target dynamic and static body stability (Reis et al., 2024).

Therapeutic interventions in ASD should address activities that influence the child to develop bodily autonomy and postural control. Children with ASD display certain behaviors and motor delays, such as tiptoeing, difficulty holding objects, kicking a ball, throwing, etc. These difficulties must be addressed on a daily basis in order to obtain accurate results and progress in treatment (Alves; Santos; Castro, 2022).

As mentioned above, most autistic children show stereotypies, which are frequent, rhythmic, unconscious movements with no defined purpose; generally, this presentation of dysfunctional patterns differs from individual to individual (each one can show different types and also the intensity is specific to each child depending on the environment or situation they are in) (Asnis; Elias, 2019).

According to Vargas (2022), stereotypes can be verbal or motor. They are considered not only a means of escape from situations where individuals with ASD feel pressure or anxiety, but also a way of expressing themselves/feeling comfortable. Among the most common motor stereotypies are rocking and flapping, body rocking and clapping respectively, finger snapping, hair twirling and ballerina feet.

Stereotyping can also pose risks because it can harm children's physical integrity, for example hitting their heads or biting themselves. Studies have shown that the constant repetition of certain movements can overload joints and muscles, resulting in injuries and discomfort. Myoarticular damage can be exacerbated in children with ASD, as they may have difficulty recognizing signs of pain or discomfort, leading them to continue with these harmful behaviours (Barros; Fontes, 2016).

Children who perform repetitive activities, such as rocking their bodies or flapping their hands, for prolonged periods have muscle tension with the presence of trigger points, and are at risk of developing conditions such as tendonitis, overuse syndromes and myoarticular pain (Barros et al., 2019).

Because of the deleterious effects that some stereotypes can have, such as overloading the motor system, self-injury or injury to others, social withdrawal, interference in learning and functionality, it is recommended that they be controlled. Stereotypies can be controlled through therapies such as Applied Behavior Analysis (ABA) (Silva, 2023).

The importance of a playful approach in activities designed for children diagnosed with ASD is that through play, they develop sensory, cognitive and motor skills, as well as their relationship with the environment and society. Playing helps with autonomy, memory and imagination, and is crucial for the child's better performance in the external environment (Mendonça et al., 2020 & Dias; Lima, 2024).

RESULTS AND DISCUSSION

Studies have been found that show positive results and an improvement in the quality of life of children with autism spectrum disorder (ASD). Physiotherapy uses a variety of resources and techniques and plays a fundamental role in the inclusion of these children in the social environment. The six studies selected were from the last ten years, with a clinical trial approach with children diagnosed with ASD.

Ferreira et al. (2016), in their study, analyzed 5 children with ASD, aged between 3 and 15 years, seeking to compare pre- and post-intervention results using the Functional Independence Measure (FIM) and the Childhood Autism Rating System (CARS). A 30-minute protocol was used in each session, 1x a week for 6 months, with playful activities that stimulate skills such as jumping, sitting, rolling; gait training; sensory and motor stimuli. The FIM used the following markers: feeding, hygiene, social interaction, walking/going down or up stairs, dressing, stool and urine control and others, to compare results.

According to Mendonça et al. (2020), children with ASD have poor eye contact, lack of interest in toys, intolerance to physical contact, hypotonia, tiptoe walking, food selectivity, little expression of pain, heat or cold, communication problems and, consequently, physiotherapy works on motor control and also on the child's interaction in the social environment.

Based on the results obtained in the tests, Ferreira et al. (2016) emphasize that autism spectrum disorder causes motor, cognitive and behavioral deficits, and that early diagnosis and multidisciplinary intervention are important to increase the effectiveness of treatment. The authors point out that the level of autism is linked to the child's autonomy and that, through the assessment of children with ASD before and after physiotherapy intervention, physiotherapy contributed significantly to the increase in the markers and functional independence of the cases analyzed.

In the research carried out by Ferreira; Santos; Castro (2023), a study involving 21 children aged between 4 and 11 with autism spectrum disorder who were members of the association of parents of autistic children, tests were carried out to assess balance, coordination, speed and laterality, and the results showed that 76.2% had difficulties with motor coordination. Changes in the posture of children with ASD interfere with their abilities, thus confirming the research by Silva and his collaborators in 2023.

Similarly, Cadore et al. (2022) ratify and describe limitations that affect children with autism, which influence their quality of life; these alterations compromise the motor system, causing hypotonia, stereotypes, difficulties with posture and balance, altered gait (walking on tiptoe), as well as delays in fine and broad motor skills and coordination. There is a link between neurological, visual and sensory alterations that have an impact on postural control and balance. Motor deficits are also related to challenges in body awareness and spatial-temporal awareness.

International Journal of Health Science ISSN 2764-0159 DOI https://doi.org/10.22533/at.ed.1595225030115

TITLE OF ARTICLE, AUTHOR, PUBLICATION	OBJECTIVE	METHODOLOGY	RESULTS AND DISCUSSIONS
Postural assessment of children with autism spectrum disorder: a case series Silva et al., 2023. Revista Observatorio De La Economia Latinoamericana	Assessing the posture of children with ASD.	This is a cross-sectional study with a quantitative approach, of the case series type. The sample was made up of five children and adolescents who were part of the parents' association	The children assessed had postural alterations, and physiotherapy and postural assessment are important for children with autism.
A comparative study of motor performance between a control group and children with Autism Spectrum Disorder. Ataíde et al., 2023. Brazilian Interinstitutional Journal of Occupational Therapy.	To compare the motor skills of children with neurotypical development and children with ASD.	Quantitative cross-sectional study with a control group, based on a descriptive comparative study carried out with 40 participants, 20 neurotypical children and 20 children with ASD belonging to level 1 in terms of severity, aged 4 to 11 and without comorbidities.	In the group of neurotypical children, the average age was 92.95 months +\- 22, 89 months and 85.70 months +\- 17, 90 months in the children with ASD; in relation to general motor age, it was found that the group with ASD had 61 +\- 9.80, while the neurotypical group had a motor age of 90.30 +\-21.30.
Evaluation of motor coordination in children with Autism Spectrum Disorder. Ferreira; Santos; Castro; 2023. Revista Fisioterapia Brasil.	Assessment of motor coordination in children with ASD.	A qualitative field study using 21 children aged between 4 and 11 with ASD and no associated pathologies. An assessment was carried out to identify deficits in global motor coordination using the Körper Koordinations test Für Kinder.	Most of the children with ASD analyzed were male and showed significant abnormalities in motor coordination. The higher the chronological age of the children, the better their motor skills.
Evaluation of balance deficits in children with Autism Spectrum Disorder. Cadore et al., 2022. Unipar Archives of Health Sciences Journal	To evaluate balance deficits in children with ASD in a city located in the interior of Rio Grande do Sul.	The sample consisted of 11 children, aged between 3 and 14, who attended an institution for autistic people.	There was a predominance of males, a statistically significant reduction in the balance scale scores and in the total score, with no difference in the gait scale score. The Tinetti balance and mobility scale and the bpm assessment showed a normal psychomotor profile.
Psychomotor profile of children with Autism Spectrum Disorder in Maceió/Al. Anjos et al, 2017. Portal Saúde E Sociedade magazine	Mapping the psychomotor profile of children with autism spectrum disorder.	This is a descriptive, cross-sectional study carried out in two specialized centers for the treatment of children with autism spectrum disorder. In the city of Maceió-AL, the sample consisted of 30 children aged between 2 and 11, of both genders, diagnosed with mild autism spectrum disorder.	The average general motor age was 70*29.3 in months, which was lower than the chronological age of 88.5*27 in months, which is equivalent to 7 years and 3 months. It was found that the children with autism spectrum disorder assessed had a lower motor age for the psychomotor elements of temporal organization and body schema and a higher one for global motor skills and balance.
Effects of physiotherapy on autistic children: case series study. Ferreira et al., 2016. Caderno De Pós-Graduação Em Distúrbios Do Desenvolvimento journal	Assessing autistic children before and after physiotherapy treatment	This was a case study of five children diagnosed with ASD. The assessment used the childhood autism classification scale and the average functional independence score. The children received individualized care. Each session lasted 30 minutes, once a week, for 6 months.	It was found that all the children, even those classified as having severe autism, obtained an increase in their FIM score and became less dependent on their caregivers after physiotherapy OT.

Chart 1: Articles on the applicability of motor physiotherapy for children with ASD.

Source: Adapted by the authors (Jesus; Lima, 2024).

Corroborating this, Ataíde et al. (2023), with a sample of 40 individuals aged between 4 and 11, compared the motor skills of children from two groups: a control group, made up of 20 children with neurotypical development, and another group, made up of 20 children diagnosed with Autism Spectrum Disorder, level 1. From the Visomotor Integration and Motor Development Scale tests it was possible to determine that general motor age, fine and global motor skills, balance, body schema, spatial-temporal, speed, language, motor coordination and visual perception were lower in the atypical group.

In the study by Anjos et al. (2017), in line with the study by Ataíde et al. (2023), a study was carried out with a sample of 30 children with ASD, aged between 2 and 11, with the aim of defining their psychomotor profile. The Rosa Neto Motor Development Scale was applied, with variables for fine and global motor skills, balance, laterality, body awareness and temporal and spatial organization. They obtained lower motor ages in body awareness and temporal awareness, stating that the chronological ages of the autistic children they analyzed differed from their motor ages.

Proposing to analyze the posture of children with ASD, Silva et al. (2023), used 5 cases of autistic children, aged between 5 and 13 years, most of them male, using photographs in the anterior, posterior and lateral planes and software to examine the data obtained. It was found that the entire sample had some kind of postural dysfunction, such as lumbar hyperlordosis associated with altered pelvic positioning and abdominal weakness; equinus foot linked to muscle weakness and decreased mobility; flat feet causing a reduced base of support and overload in the hip, knee and ankle; and cervical anteriorization.

Cadore et al. (2022) carried out a study with 11 children aged between 3 and 14 with autism, using the Time Up and Go, Tinetti and Psychomotor Battery tests to assess the participants' balance. A decrease was observed in the balance marker and global praxis. The majority of the sample showed tonicity and praxis, with no changes in gait or significant risk of falls. Also corroborating the aforementioned study (Anjos et al., 2017), they show that the dysfunctional psychomotor profile is an important factor that can and should be worked on by physiotherapists, increasing independence, functionality, skills, quality of life and aligning the child's chronological and motor age

At the same time, Silva et al. (2023) state that hypotonia is one of the main factors in postural imbalance, showing that postural alterations in autistic people have a negative impact on other functions and abilities of the individual, such as motor coordination, balance and fine and broad motor skills.

Also in collaboration with the aforementioned authors, Gaia and Freitas (2022) confirm that physiotherapy plays a fundamental role in the treatment process, making sure that the child can interact and be as independent as possible in carrying out their activities, thus working on fine and gross motor skills, balance, motor coordination and sensitivity.

All the authors listed and/or mentioned point out that motor physiotherapy provides beneficial results for the rehabilitation of children with ASD. Through the proposed studies, various motor, cognitive, sensory and social deficits that autistic people may present were highlighted, indicating that physiotherapy correlated with techniques and resources has significant effects on psychomotricity, motor and cognitive mastery, the sensory system, skills, functionality, autonomy, quality of life and social interaction.

FINAL CONSIDERATIONS

In the light of the research carried out, the real benefits acquired by autistic children are evident. The aim is to meet the individual needs of each child, using playful and interactive approaches, with a view to integrating them into the social environment, with greater safety and mastery of activities. The results obtained showed that physiotherapy has a great influence on improving balance, postural control, motor coordination, muscle strength, psychomotricity and skills. It also increases functionality and, consequently, independence and quality of life.

The alterations presented are interconnected, with difficulties in body awareness influencing psychomotor skills (especially balance and lateralization). Psychomotor alterations, learning, language delays, socialization, stereotypes, posture and tiptoe gait generate damage and have an incisive impact on the quality of life of autistic people.

Physiotherapy uses resources such as kinesiotherapy, manual therapies, hydrotherapy, sensory and play activities, gametherapy, equine therapy and psychomotricity, and studies show positive results in improving the quality of life and adaptation of autistic children in the external environment. Motor physiotherapy in ASD is wide-ranging and can be both preventative and rehabilitative, and physiotherapeutic work should be integrated into the multi-professional team provide more complete care and achieve better results.

Thus, it must be emphasized that there is a need for more research aimed at developing specific treatment protocols for children with ASD, which reinforce the obvious benefits of physiotherapeutic approaches, since there is much to be explored and discussed due to the advances in new techniques and technologies.

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