JURNAL UPI

JURNAL ASESMEN DAN INTERVENSI ANAK BERKEBUTUHAN KHUSUS

Jurnal homepage: https://ejournal.upi.edu/index.php/jassi/index

The Impact of Head Control Training on the Development of Basic Motor Skills in Children with Quadriplegic Cerebral Palsy

Arif Fakhrudin Maulana[*]

Kedutaan Besar Republik Indonesia Tashkent, Uzbekistan

Correspondence: E-mail: maulanarief17@gmail.com

ABSTRACT

Cerebral palsy is a non-progressive disorder of movement and body posture (posture) due to damage or disruption in the brain that is still growing or immature, leading to reduced motor function. The aim of this study was to determine the impact of head control training on the development of basic motor skills in children with quadriplegic cerebral palsy. The method used in this research was quantitative. Research data was obtained by conducting tests, including pre-tests and post-tests. The results revealed that the head control training program significantly contributed to the development of basic motor skills in children with Spastic Quadriplegic Cerebral Palsy. This progress is evident from the increased duration the children could maintain head and neck control, both while sitting and during 'tummy time' activities. This research provides important insights for educators and therapists in developing effective intervention methods to strengthen neck muscles and enhance head control in children with Quadriplegic Cerebral Palsy.

ARTICLE INFO

Article History:
Submitted/Received 24 Jan 2023
First Revised 28 Feb 2023
Accepted 07 Apr 2023
First Available online 01 Jun 2023
Publication Date 01 Jun 2023

Keyword:
Spastic,
Quadriplegic,
Cerebral Palsy,
Head Control Training,
Basic Motor Skills.

1. INTRODUCTION

Children's development and growth commence from the time they are in the womb until they reach the age of 5 years, a period often referred to as the golden age. During this phase, especially up to the age of three years, significant brain growth occurs. Both internal and external factors play a role in the development of brain neurons. One common condition faced by children is Cerebral Palsy (CP) (Probowati, 2019). Failure in one or both of these factors can result in abnormalities in brain development, including Cerebral Palsy (Triandari et al., 2018).

Cerebral Palsy (CP) is a motor disorder condition caused by brain damage that can occur before birth (Pre-natal), during birth (Natal), or after birth (Post-natal). Various factors can be the cause, including congenital conditions, genetic factors, inflammation, infections, exposure to toxins during pregnancy, trauma, or metabolic problems. This brain damage affects the motor system, causing the child to have problems with coordination, balance, or abnormal movement patterns (Morgan, P., & McGinley, J. L., 2018).

The American Academy for Cerebral Palsy presents a CP classification that includes: motor neuron classifications such as spastic, athetosis, rigidity, ataxia, tremor, and mixed. The topographic classification of neuromotor involvement distribution includes diplegia, hemiplegia, paraplegia, and quadriplegia (Sanusi, Sudading, & Nara P, 2022). Spastic Cerebral Palsy is categorized based on topography, including hemiplegia, diplegia, paraplegia, and quadriplegia. The motor function classification based on nerve damage occurs in CP children aged 3-5 years (Putra M. F. & Zaidah, L, 2020). Spasticity is a condition where muscles become very stiff due to lesions in the cortex or pyramidal tract pathways, causing increased tone and reflexes, which can also be accompanied by clonus (Das & Ganesh, 2019).

The prevalence of cerebral palsy cases in Indonesia is estimated to be around 1-5 per 1000 live births, with males being more dominant than females. Spastic quadriplegic cerebral palsy is a static and non-progressive condition in the brain, caused by brain damage occurring while the baby is still in the womb, during the birth process, or after birth. Physically, children with cerebral palsy typically experience delays in achieving gross motor skills, such as lying down, lifting the head, crawling, sitting, and standing, which should occur between the ages of 1 to 2 years. However, in children with this condition, their development is often delayed, so that at the age of 1-2 years, they may only reach the developmental stage of infants aged 4-6 months, such as only being able to lie down, roll over, or sit with assistance. A crucial aspect of the development of children with spastic quadriplegic cerebral palsy is head control, which is an important part of overall postural control. Disorders in head control can affect their ability to move their bodies overall, including in terms of balance and coordination, resulting in difficulties in performing daily activities. Neck control often becomes a problem in children with this condition due to issues with the central nervous system, which is responsible for the basics of movements such as sitting, crawling, and standing because a stable neck affects crawling, sitting, and other functional abilities (Naufal, 2019).

Several studies have explored ways to improve head control in children with spastic quadriplegic cerebral palsy. For instance, research by Damha Al Banna and Adiatmika (2019) showed that an exercise called "stimulation attitudinal reflex exercise" (SARE) was more effective than "prone position wedge exercise" (PPWE) in improving head control. The SARE method works by triggering reflexes at various levels, gradually aiding in the development of good postural control.

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 1412-9337 e- ISSN 2776-8783

Another study by Azizah and Widodo (2022) found that physiotherapy interventions including head control exercises, neck flexion, and the use of a standing frame with neck support (collar) could improve gross motor skills and balance in children with similar conditions. These results were measured through improvements in Gross Motor Function Measure (GMFM) scores after therapy. Although research has shown methods for improving head control in children with spastic quadriplegic cerebral palsy, there is still a need for further research in this area, particularly regarding how head control exercises can affect the development of basic motor skills in children with the condition.

Another study conducted by Hikmatul Azizah and Agus Widodo in 2022 revealed the effectiveness of a combination of head control exercises, capital neck flexion, and the use of a standing frame with neck support (Collar) in improving head control in a child with athetoid spastic quadriplegic cerebral palsy aged 1 year and 1 month. Through six physiotherapy sessions over three weeks, a significant improvement in gross motor skills was recorded, measured using an increase in Gross Motor Function Measure (GMFM) scores, as well as the duration of balance and stabilization of head control. These findings mark a significant contribution to developing more effective physiotherapy interventions for children with similar conditions. In different research by Dimas Gilang Kurniawan and Ika Rahman in 2021, it was found that Neuro-Developmental Treatment (NDT) therapy resulted in a decrease in spasticity in spastic quadriplegic cerebral palsy patients, measured with the Ashworth scale. However, there was no significant change in patient motor abilities post-therapy. Nonetheless, the patients successfully completed the planned physiotherapy program, showing a positive evaluative assessment of their ability to complete the program despite no significant improvement in independent motor skills. Research in 2020 by Susy Susmartini et al., highlighted the challenges faced by children with ataxic cerebral palsy in maintaining balance and body stability while walking, due to changes in gross motor control. This indicates the need for focused interventions to modify movement patterns and balance, essential for daily activities. These findings add to the understanding of the importance of tailored walking training for children with ataxic CP, despite limitations in research related to the use of walking aids (WA) that may affect the evaluation of physical therapy effectiveness. Lastly, an analysis by Dela Fariha Fuadi and Suminarti in 2022 emphasized the superiority of the Bobath method in improving postural control, GMFM scores, and muscle contraction effectiveness (tracked through Electromyography or EMG) compared to pilates exercises. This study also indicated that the Bobath method could be enhanced with hydrotherapy integration, offering valuable insights into optimizing exercise therapy for children with cerebral palsy.

This research collectively underscores significant advancements in physical therapy aimed at enhancing the quality of life for children with quadriplegic cerebral palsy. The primary focus is on how head control exercises can fundamentally improve their basic motor skills. Through a tailored approach for each individual, this research demonstrates that specifically designed physical therapy not only facilitates progress in gross motor abilities but also supports the development of basic motor skills. This reaffirms the importance of innovative and well-adapted therapeutic methodologies in improving social interactions and independence for children with this condition, marking a significant step forward in clinical practice for the treatment of quadriplegic cerebral palsy.

The objective of this study was to determine the impact of head control exercises on the development of basic motor skills in children with quadriplegic cerebral palsy. The method utilized in this research was quantitative. Research data was collected through tests, including pre-tests and post-tests.

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-8400 e- ISSN 2775-9857

The findings revealed that the head control exercise program significantly contributed to the development of basic motor skills in children with Quadriplegic Cerebral Palsy. This progress was evident from the increased duration the children could maintain head and neck control, both while sitting and during 'tummy time' activities. This research provides valuable insights for educators and therapists in developing effective intervention methods to strengthen neck muscles and enhance head control in children with Quadriplegic Cerebral Palsy. The study emphasizes the specialized approach used in head control exercises, potentially offering new methods in therapy to improve basic motor skills in children with the condition.

2. METHODS

The research methodology used in this study is descriptive quantitative, employing a Single Subject Research (SSR) design. The SSR design utilized in this study is the A-B design, which illustrates a cause-and-effect relationship between the dependent and independent variables. The A-B research design involves two phases of measurement: the baseline phase (A) and the intervention phase (B). This research was conducted in one of the Intervention Labs in Bandung. The study took place during the odd semester of the academic year 2023/2024. The subject of this study was a 4-year-old boy with motor impairments, specifically Quadriplegic Cerebral Palsy. Based on preliminary analysis through assessment, observation, and interviews with the child's parents, it was found that the subject still had difficulty performing basic movements.

The tool used in this research is a test instrument. This instrument was utilized to measure the child's abilities. The tests administered in this study were written tests with two phases: the baseline phase (A) and the intervention phase (B). The tests used were custom-made by the researcher and tailored to the theory. The baseline phase was conducted once to reveal the subject's initial condition, which in this case was the ability to recognize geometric shapes. The percentage score obtained in the baseline phase was calculated by dividing the subject's score by the maximum possible score and then multiplying by 100%. Meanwhile, the intervention phase or treatment provided in this SSR study utilized a gym ball. The intervention phase was carried out once with a duration of 60 minutes. Subsequently, the data collected from the baseline and intervention phases were analyzed.

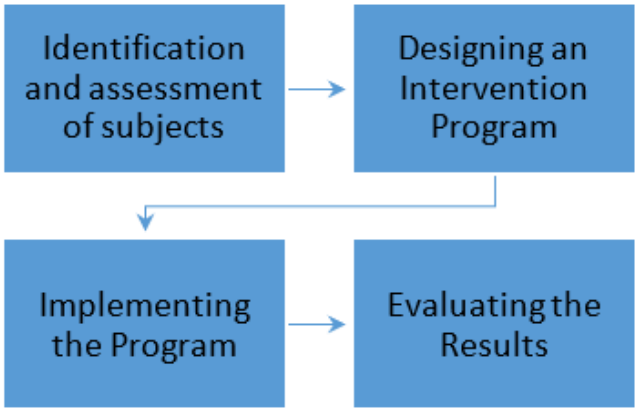

Figure 1 . Research stages

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 1412-9337 e- ISSN 2776-8783

3. RESULTS AND DISCUSSION

3.1. Student Demographics

This study utilizes a single subject research (SSR) method. This method is an experimental approach used to observe and assess the impact of a specific intervention or treatment on an individual's behavior, by conducting repeated measurements over a predetermined period (Prahmana, 2021). The subject in this study is a 4-year-old boy diagnosed with a motor disorder, namely Quadriplegic Cerebral Palsy. At the age of 4 years, this child's motor development has not yet reached the level of development typically expected of his peers. He is still unable to control his neck and support his head on his own, both when in a prone position (tummy time) and when sitting. These individuals experience significant difficulties in performing basic movements, indicating substantial limitations in motor capacity that affect the quality of his daily life, signifying a significant delay in the development of basic motor skills.

3.2. Development Program

The development of this program is based on the results of subject assessments as in **Table 1**. which contains a profile of abilities, obstacles, needs and implications for the program. Family-based programs are designed based on the needs of children and the potential of families in developing children's development to be more optimal (Rizqita et al., 2024).

Table 1. Profile because of the assessment

Ability	Obstacle	Need	Implications
The child can respond to surrounding sounds, albeit with just a glance and a smile.	The child is not yet able to respond verbally (only a few words are verbally expressed, namely "no" and "yes yes").	The child needs to be trained to strengthen their neck muscles so they can support their own head.	The child needs exercises for flexing and extending the arms and shoulders.
The child has become capable of slightly tilting their body when in a lying position.	The child is not yet able to control the strength of their neck.	The child needs to be trained to roll over.	The child needs exercises to move the body to the right and to the left.
The child can grasp objects.	The child cannot control the movement in their right arm, resulting in improper anatomical positioning.	The child should be provided with auditory and visual stimuli to enable them to respond to their surroundings.	The child needs exercises to turn their head to the right, to the left, upwards, and downwards.
	The child experiences stiffness in all limbs when feeling shocked and uncomfortable.		
	The child is not yet able to support and		

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-8400 e- ISSN 2775-9857

push their body to tilt sideways independently.	
The child cannot roll over from a prone position to a supine position and vice versa.	

The intervention program focuses on the development of neck control abilities, which are essential for the child's ability to support his own head and body. To achieve this, the program comprises several structured activities:

1. Enhancing Head Lifting Abilities: Initiate by placing the child in a prone position, then utilize brightly colored toys or produce pleasant sounds in front of the child to encourage them to lift their head and chest. This activity is crucial for developing the strength in the neck and upper back muscles, laying the groundwork for more advanced motor skills.
2. Facilitating Rolling Movements: Employ brightly colored toys to capture the child's attention, then slowly move the toy to the opposite side, assisting initially by crossing the child's legs to facilitate a rolling movement. This method helps the child develop the coordination and control necessary for rolling, an important milestone in motor development.
3. Promoting Upright Head Control: Holding the child in an upright position encourages them to learn to keep their head steady. This practice is vital for strengthening the neck muscles and developing the balance and coordination needed for sitting and standing.
4. Strengthening Neck Muscle Control: To fortify the neck muscles, the child is gently encouraged to move from a lying to a semi-seated position by pulling on their arms, closely monitoring the head's response. If the child's head does not lift, it indicates that the neck muscles are not yet strong enough to support head control, signifying the need for ongoing strengthening exercises.

The primary objective of this program is to enable the child to develop an enhanced ability to control their head movements. This capability is crucial as it forms the foundation for the child's ability to independently support their head and body. By fostering improved head control, it is anticipated that the child will progress to subsequent developmental stages, including the ability to independently roll over. In the long term, the program aims to assist the child in achieving the ability to sit upright on their own.

During the first meeting, the child specifically struggled with his right hand and required positional correction for his left hand. The child was also not yet able to support his head on his own. In the second meeting, although the child was still unable to support his head and sounded tired when prone, there was potential and a desire to reach for objects. Within a few minutes, with assistance, the child could lift his head and hold it for a few seconds. In the third meeting, the child began to get accustomed to 'tummy time' exercises and responses to visual stimulation. By the fourth meeting, the child was able to follow the movement of objects and hold his head upright for longer.

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
p- ISSN 1412-9337 e- ISSN 2776-8783

In the fifth meeting, the child showed the ability to follow the direction of toys and lift his head on his own from a slumped position. By the sixth meeting, the child was able to maintain neck position independently for longer and in the seventh meeting, the child was able to lift his head while in a prone position with assistance. In the eighth meeting, the child could tilt his body on his own and lift his head better. The ninth meeting revealed that the child could still control his head despite initial difficulties. And in the tenth meeting, the child showed significant progress in controlling his neck, with the ability to gradually lift his head and maintain neck control for longer periods while sitting.

Table 2. explain about this program has successfully demonstrated significant progress in the development of better head control in the child. This improvement is evident from the longer duration in performing various activities, indicating that the child has started to have sufficient neck strength to support his head, especially when sitting with assistance.

Initial Conditions	Condition After carried out the program
The child's body is very stiff, making it difficult to perform flexion and extension exercises.	Controlling body movements more effectively, especially in flexion and extension activities of body parts.
The child is unable to support their own head.	Supporting their own head temporarily, indicating progress in basic motor control.
The child is unable to perform body tilting movements to the right and left.	Performing body tilting movements to the right and left with assistance, although still requiring intensive assistance.
The child is unable to hold and control the neck.	Holding and controlling the neck in different positions, such as turning to the right and left, upwards, and downwards, with increasing duration.
The child is unable to lift their head during tummy time.	Lifting the head and maintaining that position in various activities, such as tummy time, although still requiring additional assistance.
The child is unable to lift their head in head control positions.	Lifting the head in a sitting position, indicating progress in head control.

4. CONCLUSION

The conclusion of this study highlights that children with cerebral palsy often experience delays in achieving gross motor abilities, such as lying down, lifting the head, crawling, sitting, and standing - skills that usually develop between the ages of 1 to 2 years. Furthermore, this condition significantly impacts head control, which is a crucial component of postural control. Disturbances in head control can interfere with the child's ability to move their entire body, including in terms of balance and coordination, leading to difficulties in daily activities. Stable neck control is very important and often poses a challenge for children with this condition, affecting their ability to crawl, sit, and other functions.

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-8400 e- ISSN 2775-9857

This research, utilizing a quantitative method with pre-tests and post-tests, shows that head control exercises have a very positive effect on improving basic movement skills in children with quadriplegic cerebral palsy. The exercise program has been proven effective in increasing the duration a child can maintain head and neck control, especially while sitting and during 'tummy time' activities. These findings provide important insights for educators and therapists in developing intervention methods designed to strengthen the neck muscles and improve head control, which in turn assists in the motor development of children with quadriplegic cerebral palsy.

5. ACKNOWLEDGMENT

Thank you to all parties who have been involved in this research, I hope this research will be useful.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

7. REFERENCES

Azizah, H., & Widodo, A. (2022). Case Study: Efektifitas Head Control Exercise, Neck Capital Flexion, dan Standing Frame with Neck Collar Terhadap Kemampuan Head Control pada Cerebral Palsy Spastik Quadriplegi Athetoid. *Jurnal Kesehatan dan Fisioterapi*, 53-59.

Damha Al Banna, I., & Adiatmika, M. Stimulation Attitudional Reflex Exercise Lebih Baik Dibandingkan Dengan Prone Position Wedge Exercise Terhadap Head Control Pada Anak Cerebral Palsy Spastik Quadriplegi Di Rs Rajawali Citra Bantul, Yogyakarta.

Fuadi, D. F., & Suminarti, S. (2022). Systematic Review: Efektivitas Bobath Exercise Pada Cerebral Palsy Spastik Diplegi. *Indonesian Journal of Health Science*, *2*(2), 44-53.

Kurniawan, D. G., & Rahman, I. (2021). Penatalaksanaan Fisioterapi pada Kasus Cerebral Palsy Spastic Quadriplegi dengan Menggunakan Neuro Development Treatment di RSUD Cikalong Wetan Kabupaten Bandung Barat. *Journal of Health Science and Physiotherapy*, *3*(3), 111-117.

Morgan, P., & McGinley, J. L. (2018). Cerebral palsy: Balance, gait, and falls. Balance, Gait, and Falls.

Naufal, A. F. (2019). Mengenal Dan Memahami Fisioterapi Anak. Jawa Tengah: Penerbit *Muhammadiyah University Surakarta*.

Probowati, A. (2019). Peran fisioterapi terhadap kemajuan motorik pada anak dengan cerebral palsy. *The Journal of Medical School*, 52(2), 84–88.

Putra, M. F., & Zaidah, L. (2020). Pengaruh Bobath neuro development treatment (NDT) terhadap kemampuan duduk pada penderita cerebral palsy usia 6 bulan sampai 12 tahun. *In Proceedings of the URECOL* (pp. 16–20).

Prahmana, R.C.I. (2021). Single Subjek Research (Teori dan Implementasi: Suatu Pengantar). UAD Press.

Rizqita, A. J., Sunardi, S., & Bela, M. R. W. A. T. Development of Traluli Program of Family-Resourced Early Intervention for Multiple Disability and Visual Impairment (MDVI) Children with Fine Motor Impairment in Inclusive School. *Indonesian Journal of Community and Special Needs Education*, 4(1), 65-74.

Sanusi, Sudading, & Nara, P. (2022, May 28). Cerebral palsy.

Susmartini, S., Herdiman, L., & Rochman, T. (2020, November). Evaluasi Kontrol Postural Pada Anak Ataxic Cerebral Palsy Pada Saat Berjalan Dengan Anterior Walker Pengembangan Menggunakan Free Software CvMob. In *Talenta Conference Series: Energy and Engineering (EE)* (Vol. 3, No. 2).

Triandari, L., Tirtayasa, K., Irfan, M., & Wihandani, D. M. (2018). Kombinasi Perceptual Motor Program Dan Neurodevelopmental Treatment Lebih Baik Daripada Treatment Dalam Meningkatkan Kemampuan Duduk 6(2), 31–37.

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-8400 e- ISSN 2775-9857