

## PHYSIOTHERAPY MANAGEMENT OF DOWN SYNDROME: CASE REPORT

Alfina Ramadani Dyah Efendi<sup>1</sup>, Adnan Faris Naufal<sup>1</sup>, Christine Viola<sup>2</sup>

<sup>1</sup>Departement of Physiotherapy, University of Muhammadiyah Surakarta, Surakarta, Central Java, Indonesian

<sup>2</sup>Disability and Inclusion Service Health Centre Surakarta

\*Corresponding author: Alfina Ramadani Dyah Efendi, Email: [alfina.ramadani.ar@gmail.com](mailto:alfina.ramadani.ar@gmail.com)

### Abstract

**Introduction** : Down syndrome is a genetic condition or disorder caused by a chromosomal abnormality that occurs threefold in total or part of chromosome 21. Decreased muscle strength and balance are one of the consequences that occur in the condition of down syndrome. In this study the aim was to determine the effect of providing physiotherapy management in cases of Down syndrome. The research method used in this study was a case study involving a 4-year-old girl diagnosed with Down syndrome. Subjects were given physiotherapy interventions for 3 weeks with a frequency of 2 meetings a week. The interventions provided were walking on a textured catwalk, walking on an inclined plane, and jumping on a trampoline based on a stretch-shortening exercise. The examination given for this case is checking muscle strength using the manual muscle testing method and checking balance using the balance beam test. In this study, the results showed that there were changes in the subject's muscle strength and dynamic balance ability.

**Keywords** : Down Syndrome, Muscle Strength, Balance, Exercise

### INTRODUCTION

Children born into the world will experience growth and development as they age. This will start from the time the child is in the womb until the child grows up. However, children will experience stages of growth and development with the same pattern. However, if at this stage of growth and development there are problems, this will have an impact on further development. Not all children experience the same growth and development process, so some children require special treatment during their developmental stages.

One of the conditions of children who require special treatment is Down syndrome. Down syndrome itself is one of the most common and easily identifiable genetic conditions or disorders in children. Down syndrome is a chromosomal disorder that occurs threefold in total or part of chromosome 21 (Melo et al., 2022). Down syndrome accounts for as much as 91% of all genetic disorders and occurs in 1 in 1,000 live births each year (Azab et al., 2022).

Children with Down syndrome have motor characteristics such as hypotonia or hypertonus in their joints, decreased reflexes in tendons, decreased balance, motor coordination, and sensory integration, and vestibular deficits (Carter et al., 2018). In addition, children with Down syndrome also experience difficulties in maintaining their posture. It is very common for children with Down syndrome to experience muscle weakness, especially the muscles of the lower extremities (Azab et

al., 2022). A sedentary lifestyle also increases the risk of acquiring secondary physiological pathologies, such as cardiovascular disorders, muscle hypotonus, osteoporosis, arthritis, osteoarthritis, diabetes mellitus, and obesity. Muscle atrophy and strength to poor endurance are part of the result of a lifestyle that is less physically active or doesn't move much (Paul et al., 2019).

In the condition of children with Down syndrome it is found that they have standing balance disorders. This is because children with Down syndrome experience a decrease in balance because the brain stem and cerebral hypoplasia are disturbed, causing impaired motor function and posture control (Azab et al., 2022). This causes the child to be unable to maintain his posture. Individuals with vestibular disorders have difficulty maintaining their balance which causes a decrease in postural control (Carter et al., 2018). Disturbances in the function of lower extremity movements make someone with Down syndrome have to make more effort to maintain their body in maintaining balance (Hazmi & Tirtayasa, 2013).

Today physical exercises are being actively used to increase lower extremity muscle strength and posture control. One of them is the use of trampolines based on stretch-shortening exercises. This exercise is a form of exercise that involves muscle contraction, one of which is the use of the jumping method. Where in this exercise the muscles will go through eccentric, concentric, and isometric phases (Azab et al., 2022). Vestibular enhancement therapy itself is useful for increasing muscle strength and balance.

## RESEARCH METHODS

In this study, the researchers used a case study research method conducted at the Surakarta City Disability and Inclusion Service Center with an An patient. D is 4 years old with a medical diagnosis of Down Syndrome. This research was conducted regularly at the Surakarta City Disability and Inclusion Service Center twice a week for 3 weeks. The patient received physiotherapy intervention by walking on a textured boardwalk and jumping on a trampoline. This aims to increase the patient's lower extremity muscle strength and improve the patient's balance ability. To evaluate the results of the intervention in this study using examination of muscle strength with Manual Muscle Testing (MMT) and dynamic balance using the Balance Beam Test.

## RESULTS

This study was conducted with 3 physiotherapy interventions for 3 consecutive weeks. The goal of providing physiotherapy intervention itself is to increase muscle strength and maintain the patient's balance ability. After the intervention, the patient was re-evaluated using the Manual Muscle Testing (MMT) and Balance Beam Test.

Regio	Muscles Group	Dextra				Sinistra			
		Pre	T1	T2	T3	Pre	T1	T2	T3
Hip	Fleksor	3+	3+	4	4	3+	3+	4	4

	Ekstensor	3+	3+	3+	3+	3+	3+	3+	3+
	Abductor	3+	3+	3+	3+	3+	3+	3+	3+
	Adductor	3+	3+	3+	3+	3+	3+	3+	3+
Knee	Fleksor	3+	3+	4	4	3+	3+	4	4
	Ekstensor	3+	3+	3+	3+	3+	3+	3+	3+
Ankle	Inversi	3+	3+	3+	3+	3+	3+	3+	3+
	Eversi	3+	3+	3+	3+	3+	3+	3+	3+
	Plantar Fleksor	3+	3+	3+	3+	3+	3+	3+	3+
	Dorsal Fleksor	3+	3+	3+	3+	3+	3+	3+	3+

Table 1 Evaluation of Muscle Strength

After 3 weeks of intervention, the results showed that there was a change in the increase in lower extremity muscle strength in the hip and knee flexor muscle groups on the right and left sides as shown in the table above.

Testing	Pre	Post		
		T1	T2	T3
Balance beam test	1	1	2	2

Table 2 Evaluation of Balance

In addition to measuring muscle strength, a dynamic balance examination was also carried out and the results showed that there was an increase in the patient's ability to maintain balance as shown in the table above.

## DISCUSSION

### A. Intervention of Physiotherapy

#### 1. Walking on a Textured Boardwalk Exercise

Walking on a boardwalk exercise aim to improve balance abilities in children with special needs, especially children with Down syndrome (Padafani et al., 2019). Textured mats also help children train tactile sensory response abilities in children (Stephen, 2015).

**Preparation of tools and places:** Make sure the tools and places are in a safe and comfortable condition.

**Management :** The patient is in a standing position at the point before the textured footbridge. Give instructions to the child if later they have to pass through the textured catwalk so they don't fall. Make sure the child's condition is safe by still accompanying the child behind or beside the child. These textured footbridges are 150 cm apart. This intervention aims to improve the child's dynamic balance ability and stimulate tactile responses, especially on the soles of the child's feet.



Picture 1 Walking On Boardwalk Exercise

## 2. Walking on an inclined plane Exercise

Walking on an inclined plane exercise aim to improve the balance ability of children with special needs, including Down syndrome (Padafani et al., 2019).

**Preparation of tools and places:** Make sure the tools and places are in a safe and comfortable condition.

**Management :** The patient is in a standing position at the point before the inclined plane. Give instructions to children if later they have to pass through the field so they don't fall. Make sure the child's condition is safe by still accompanying the child behind or beside the child. The inclined plane has a slope of 30 degrees and a height of 20 cm. This intervention aims to improve the child's balance ability.



Picture 2 Walking on An Inclined Plane Exercise

## 3. Jumping on the Trampoline Exercise

Jumping on the trampoline exercise aim to increase lower extremity muscle strength and balance abilities in children with Down syndrome (Azab et al., 2022).

**Preparation of tools and places:** Make sure the tools and places are in a safe and comfortable condition.

**Management :** The patient is in a standing position on the edge of the trampoline. Give instructions to children if they have to jump 5 times on the trampoline and maintain a

standing position so they don't fall. Make sure the child's condition is safe by still accompanying the child behind or beside the child. This intervention aims to improve the strength of the lower extremities and the ability of the child's dynamic balance.



Picture 3 Jumping on The Trampoline Exercise

## B. Measurement Evaluations

### 1. Evaluation of Muscle Strength

Based on table 1 which contains the evaluation results of examining lower extremity muscle strength using Manual Muscle Testing (MMT), after being given an intervention for 3 weeks, the results of muscle strength were obtained on the dextra hip flexor (4), sinistra hip flexor (4), dextra hip extensor (3+), sinistra hip extensor (3+), dextra hip abductor (3+), sinistra hip abductor (3+), dextra hip adductor (3+), sinistra hip adductor (3+), dextra flexor knee (4), sinistra flexor knee (4), dextra extensor knee (3+), sinistra extensor knee (3+), dextra inversor ankle (3+), sinistra inversor ankle (3+), dextra eversor ankle (3+), sinistra eversor ankle (3+), dextra plantar flexor ankle (3+), sinistra plantar flexor (3+), dextra dorsal flexor ankle (3+), and sinistra dorsal ankle flexor (3+). Based on the results of the evaluation carried out by the examination, the strength of the lower extremity muscles experienced an increase in the hip flexor and knee flexor muscle groups. This is in accordance with previous research by Azab et al., (2022), that exercises on the lower extremities, especially trampoline exercises based on stretch-shortening exercises, can increase lower extremity muscle strength. This may result from the rapid and repetitive transformation of training movements between contracting and relaxing movements of the muscles. This results in increased recruitment of motor units as a result of activation of the stretch reflex during jumping activities. However, there are several muscle groups that have not increased due to the lack of intensity of training.



Picture 4 Measurement Evaluation of Muscle Strength

## 2. Evaluation of Balance

Based on table 2 which contains the results of the evaluation of dynamic balance examinations using the Balance Beam Test, after being given an intervention, the result is a value of 2. Where before being given the exercise, the patient only gets a value of 1 with the patient's ability to not be able to cross the boardwalk and fall before completing it. However, after being given intervention for 3 weeks the child was able to cross the boardwalk even though he had to stop several times. This is because the exercise of walking on a textured footbridge can improve the walking balance of Down syndrome patients. In addition, walking on an inclined plane also has benefits in improving the balance of children with Down syndrome (Padafani et al., 2019).



Picture 5 Measurement Evaluation of Balance

## CONCLUSION

Based on the results of the study, it was concluded that giving interventions for 3 weeks with a frequency of 2 times a week can provide changes in increasing muscle strength and the ability to maintain dynamic balance in children with Down syndrome.

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