Effectiveness Of Pelvic Proprioceptive Neuromuscular Facilitation On Balance And Gait Parameters In A Child With Duchenne Muscular Dystrophy: A Case Report

Sakshi Runwal[1] , Pallavi Palaskar[2] , Riya Bhanushali[3] , Hiral Lodhiya[4] , Pranjal Kotecha[5] , Divya Pawar[6]

1. *Second Year Post Graduate Scholar, Department of Neuro Physiotherapy, MGM School of Physiotherapy, Chh Sambhaji Nagar, A Constituent Unit of MGMIHS, Navi Mumbai, Maharashtra.*
2. *Associate Professor ,Head of the Department of Neuro Physiotherapy and PhD, MGM School of Physiotherapy, Chh Sambhaji Nagar, A Constituent Unit of MGMIHS, Navi Mumbai, Maharashtra.*
3. *First Year Post Graduate Scholar, Department of Neuro Physiotherapy, MGM School of Physiotherapy, Chh Sambhaji Nagar, A Constituent Unit of MGMIHS, Navi Mumbai, Maharashtra.*
4. *First Year Post Graduate Scholar, Department of Neuro Physiotherapy, MGM School of Physiotherapy, Chh Sambhaji Nagar, A Constituent Unit of MGMIHS, Navi Mumbai, Maharashtra.*
5. *Intern, MGM School of Physiotherapy, Chh Sambhaji Nagar, A Constituent Unit of MGMIHS, Navi Mumbai, Maharashtra.*
6. *Intern, MGM School of Physiotherapy, Chh Sambhaji Nagar, A Constituent Unit of MGMIHS, Navi Mumbai, Maharashtra.*

Corresponding Author:
Namrata Sant
PhD Scholar , Assistant Professor , MGM School of Physiotherapy, Chh. Sambhaji Nagar, A Constituent Unit of MGMIHS, Navi Mumbai, Maharashtra
Email ID: namratassant@gmail.com

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ABSTRACT

Duchenne Muscular Dystrophy (DMD) is a progressive neuromuscular disorder that impairs balance and gait, eventually leading to loss of ambulation. This case report explores the effects of pelvic proprioceptive neuromuscular facilitation (PNF) techniques on a child with DMD. An 8-year-old male received a four-week physiotherapy regimen consisting of conventional therapy followed by pelvic PNF. Clinically significant improvements were noted in stride length, step length, cadence, and Paediatric Balance Scale (PBS) scores after PNF treatment, exceeding the gains from conventional therapy alone. These findings suggest that pelvic PNF may enhance postural control and functional mobility in children with DMD and should be explored further.

INTRODUCTION

Duchenne muscular dystrophy (DMD) is a serious inherited form of muscle weakness. It is an extremely common hereditary neurological and muscular condition, occurring independent of race or ethnicity. Defects in the dystrophin gene cause gradual muscle fibre degeneration and weakening (1). As of 2022, the worldwide incidence of dystrophy of the muscles was expected to be 3.6 per 100,000 persons, with DMD at 4.8 per 100,000 people (2).

Clinical manifestation of DMD include lumbar lordosis and scoliosis with muscle contractures can arise. Scoliosis can decrease pulmonary function, resulting in pulmonary compromise. Ankle, knee, hip,

and elbow contractures may occur. Weakness and trouble walking are often noticed between the ages of two and three. This presents as toe walking, difficulties jogging, climbing stairs, and frequent falls. Weakness is more noticeable in proximal muscles than distal muscles, and in the lower limb more than the upper. The frequent falls in ambulatory patients have been linked to an increased incidence (3).

Proprioceptive Neuromuscular Facilitation (PNF) is a rehabilitation technique that enhances motor control and functional movement through specific, guided patterns and proprioceptive input. In paediatric populations, especially those with neuromuscular disorders, PNF helps stimulate muscle activation and improve coordination. Pelvic PNF techniques specifically target pelvic alignment and mobility, which are crucial for maintaining trunk stability and facilitating effective gait patterns. (5)

Previous research has indicated that proprioceptive neuromuscular facilitation (PNF) improves trunk control and lower limb coordination in children with cerebral palsy (4), and it has showed promise in treating pelvic malalignment in spastic individuals (5). Given the similarities in postural instability and gait dysfunction between cerebral palsy and DMD, the use of pelvic PNF in this study aims to investigate its potential benefits in improving balance and gait in children with DMD, building on existing evidence from related neuromuscular conditions.

METHODS AND MATERIALS

Study Design and Data Source

- Type: Descriptive
- Design: Case Report
- Target Population: Child with Duchenne Muscular Dystrophy
- Sample Size: 1
- Age Group: 8-year-old male
- Duration of Study: 45 minutes/day, 5 days/week, for 4 weeks
- Data Collection Period: 4 weeks
- Sampling Design: Purposive sampling
- Source of Data: Clinical assessment, therapy records, and standardized outcome measures

ETHICAL APPORVAL AND CONSENT

Ethical approval was granted by the Institutional Review Board of [Institution Name], Ref. No: . Informed written consent was obtained from the patient's legal guardian.

INTERVENTION PROTOCOL

Weeks 1–2 (Conventional Physiotherapy):

- Stretching of tight muscle groups
- Weight-bearing for tone reduction
- Strengthening of weak muscle groups
- Scapular exercises for postural control
- Task-oriented upper limb activities

Weeks 3–4 (Pelvic PNF + Conventional PT):

- Anterior elevation and posterior depression PNF patterns

- Rhythmic initiation and slow reversals
- Combined with task-oriented upper limb training.

OUTCOME MESAURES

- Paediatric Balance Scale (PBS)
- Stride Length (cm)
- Step Length (cm)
- Cadence (steps/min)

RESULTS

Variable	Time	Mean
PBS	Baseline	32
	After 2 weeks	36
Stride Length	Baseline	50
	After 2 weeks	53
Step Length	Baseline	24
	After 2 weeks	27
Cadence	Baseline	51
	After 2 weeks	56

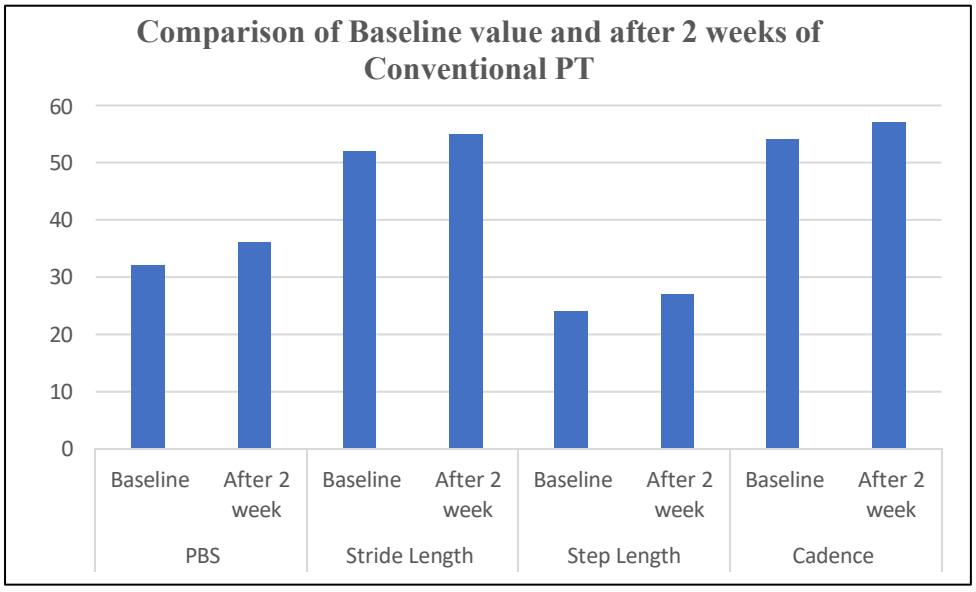

Table 1 and 2: Comparison of Baseline value and after 2 weeks of conventional physiotherapy.

Variable	Time	Mean
PBS	Baseline	36
	After 2 weeks	45
Stride Length	Baseline	53
	After 2 weeks	66
Step Length	Baseline	27
	After 2 weeks	33
Cadence	Baseline	56
	After 2 weeks	67

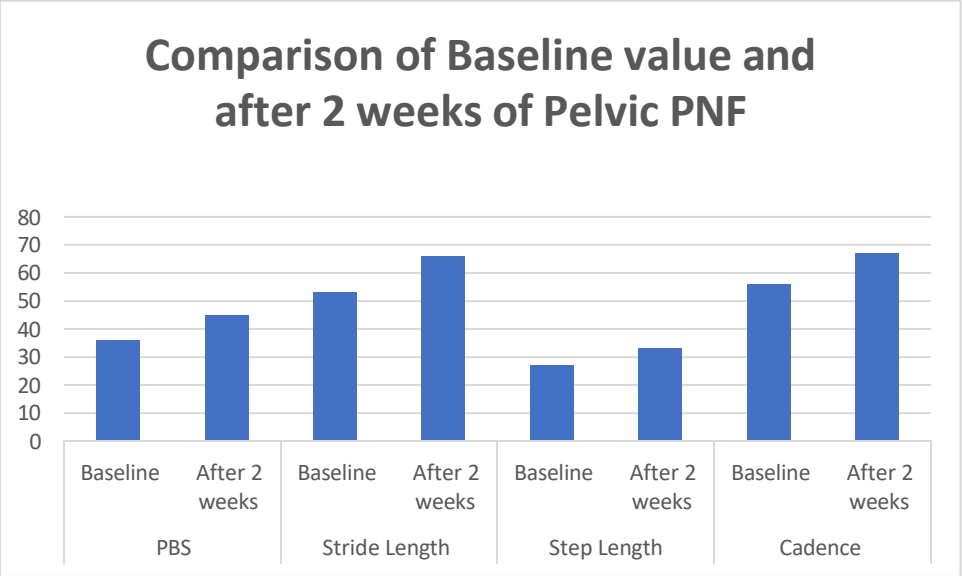

Table 3 and 4: Comparison of Baseline value and after 2 weeks of pelvic PNF.

DISCUSSION

Because dystrophin, a protein necessary for maintaining the integrity of muscle fibres, is absent in Duchenne Muscular Dystrophy (DMD), the condition is characterized by progressive muscular degeneration and weakening. Gait and balance are significantly impacted when muscle wasting worsens, which frequently results in early adolescence loss of ambulation (6). With a focus on methods that maintain joint range, retain muscle length, and improve neuromuscular coordination, physiotherapy has a well-established role in extending functional mobility and enhancing quality of life in people with DMD (7,8).

By focusing on the trunk and pelvic musculature, proprioceptive neuromuscular facilitation (PNF), and in particular pelvic PNF patterns, aim to improve neuromuscular control and stability. A key component of gait mechanics and postural control is the pelvis. In this instance, the use of pelvic PNF techniques resulted in a notable improvement in stride length, step length, cadence, and Paediatric Balance Scale (PBS) scores, indicating improved motor coordination and postural control.

PNF stimulates weak or underactive muscles and enhances proprioceptive input by combining physical resistance with particular movement patterns. Patients with neurological conditions, such as cerebral palsy and stroke, have shown benefits from this approach in the past (9,10). Although there isn't much research specifically on DMD, the use of pelvic PNF in this instance offers some initial evidence in favour of its inclusion in neuromuscular rehabilitation.

Although the progression of DMD is inevitable, early and targeted physiotherapy interventions can temporarily optimize function and potentially delay the onset of severe motor limitations. The positive response to pelvic PNF in this case supports the role of individualized, goal-oriented therapy even in progressive conditions like DMD. Improvements observed in this case may be attributed to the facilitation of trunk and pelvic stabilizers, which may lead to more controlled pelvic tilting, improved lower extremity alignment during gait, and improved weight shift during dynamic activities.

CONCLUSION

This case study shows that children with Duchenne Muscular Dystrophy can benefit from Pelvic Proprioceptive Neuromuscular Facilitation as an intervention to enhance their walking and balance. Improved motor control and functional mobility are reflected in the noted gains in cadence, stride length, step length, and Paediatric Balance Scale. This case supports the inclusion of pelvic PNF patterns in the rehabilitation protocols for children with DMD in order to maximize their ambulatory potential and functional independence for as long as possible, even though larger-scale studies are required.

Conflict of Interest

The authors declare no conflict of interest.

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