Effect of kinesiology taping on head and trunk control in children with Duchenne muscular dystrophy

Efecto del vendaje kinesiológico en el control de la cabeza y el tronco en niños con distrofia muscular de Duchenne

Authors

Manal Helmy Koura [1]
Noha S. ElSerty [2]
Lamyaa M. Kassem [3]
Fatma Essam Amer [4]
Hebatallah Mohamed Said Zaghloul [5]
Hanady Abdallah Mouhamed [6]

[1, 2, 5, 6] Benha University, Benha Egypt
[3] Qassim University, Qassim, Saudi Arabia
[4] Innovation University, 10th of Ramadan city, Egypt

Corresponding author:
Manal Helmy Koura
Manal.helmy2021@fpt.bu.edu.eg

Received: 18-11-25
Accepted: 27-12-25

How to cite in APA

Koura, M. H., & ElSerty, N. S. (2026). Effect of kinesiology taping on head and trunk control in children with Duchenne muscular dystrophy. *Retos, 75*, 662-674. https://doi.org/10.47197/retos.v75.118148

Abstract

Objectives: Examine the effects of Kinesiology Taping (KT) on head and trunk control in children diagnosed with Duchenne muscular dystrophy (DMD).
Design: A randomized controlled trial.
Settings: Outpatient Clinics, Physical Therapy faculty, Benha University, Egypt.
Subjects: forty-eighth children diagnosed with DMD, aged 8 to 12 years.
Intervention: Children were equally (n = 24/group) assigned to two groups in a random manner. The study group received KT applied to the head and trunk extensors in conjunction with the traditional physical therapy (TPT) program over 8 weeks. The control group underwent only the TPT program for the same duration.
Main measures: The primary outcomes included H-reflex latency and amplitude, which were assessed using an electromyography device for the levator scapulae and iliocostalis lumborum muscles. Additionally, the Pediatric Quality of Life Inventory (PedsQL) Multidimensional Fatigue Scale (MFS) was utilized for both the children and their parents, with data collected at baseline and following the intervention.
Results: The results revealed significant differences in the levator scapulae and iliocostalis lumborum muscles after an eight-week intervention period, with the study group demonstrating greater changes than the control. Additionally, comparisons of PedsQL and MFS scores before and after the intervention showed significant improvements.
Conclusions: KT can improve head and trunk control in DMD patients.

Keywords

Kinesiology taping; head control; trunk control; Duchenne muscular dystrophy.

Resumen

Objetivos: Examinar los efectos del vendaje neuromuscular (Kinesiology Taping, KT) sobre el control de la cabeza y el tronco en niños diagnosticados con distrofia muscular de Duchenne (DMD).
Diseño: Ensayo controlado aleatorizado.
Entorno: Clínicas ambulatorias, Facultad de Fisioterapia, Universidad de Benha, Egipto.
Sujetos: Cuarenta y ocho niños diagnosticados con DMD, con edades comprendidas entre 8 y 12 años.
Intervención: Los niños fueron asignados aleatoriamente en dos grupos iguales (n = 24 por grupo). El grupo experimental recibió KT aplicado a los músculos extensores de la cabeza y el tronco junto con el programa tradicional de fisioterapia (TPT) durante 8 semanas. El grupo de control realizó únicamente el programa TPT durante el mismo período.
Medidas principales: Las variables primarias incluyeron la latencia y la amplitud del reflejo H, evaluadas mediante un dispositivo de electromiografía en los músculos elevador de la escápula e iliocostal lumbar. Además, se utilizó la Escala Multidimensional de Fatiga (MFS) del Inventario de Calidad de Vida Pediátrica (PedsQL) tanto para los niños como para sus padres, con datos recogidos al inicio y después de la intervención.
Resultados: Los resultados mostraron diferencias significativas en los músculos elevador de la escápula e iliocostal lumbar después de un período de intervención de ocho semanas, con mayores cambios en el grupo experimental en comparación con el grupo de control. Asimismo, la comparación de las puntuaciones del PedsQL y del MFS antes y después de la intervención mostró mejoras significativas.
Conclusiones: El vendaje neuromuscular (KT) puede mejorar el control de la cabeza y el tronco en pacientes con DMD.

Palabras clave

Vendaje neuromuscular; control de la cabeza; control del tronco; distrofia muscular de Duchenne.

Introduction

The majority Duchenne muscular dystrophy (DMD) is the most common childhood muscular dystrophy, with an incidence of approximately 1 in 3500–5000 live male births and a global prevalence around 3–7 per 100,000 males, leading to progressive loss of independent mobility and premature mortality despite advances in multidisciplinary care. Recent epidemiological reviews from 2020 onwards continue to highlight DMD as a major contributor to lifelong disability, health care utilization, and caregiver burden, emphasizing the need for interventions that preserve function and participation in daily life. In addition to skeletal muscle weakness, a substantial proportion of boys also experience cognitive and behavioral difficulties, further compounding the overall disease burden on quality of life (Salari et al., 2022).

Non ambulatory stage and complications

Progressive proximal muscle weakness in DMD typically results in loss of independent ambulation during late childhood or early adolescence, after which children transition to a predominantly wheelchair dependent, non ambulatory stage (Vaillend et al., 2025). This stage is characterized by rapid deterioration in trunk and head control, development of scoliosis and contractures, and increasing reliance on assistive devices for posture and mobility. Secondary complications, including restrictive respiratory failure, impaired cough, and cardiomyopathy, are closely linked to declining axial muscle function and further restrict participation in school, play, and community activities (Okawara et al., 2025).

Functional importance of trunk control

Trunk control is a central determinant of functional performance in non ambulatory DMD, as postural stability of the head and trunk provides the proximal base required for effective upper limb use. Better trunk stability has been associated with superior upper limb strength and reaching ability, enabling age appropriate participation in activities of daily living (ADLs) such as upper limb reaching, grooming, and self care (Orozco et al., 2025). Conversely, impaired trunk control limits seated balance, restricts independent feeding, wheelchair propulsion, and classroom activities, and is associated with lower health related quality of life and greater caregiver dependence. Despite the functional importance of trunk control, few interventions specifically target trunk stability in children with DMD, and trunk oriented approaches have only recently begun to show promising effects on arm function and respiratory parameters (Bulut et al., 2022).

Kinesiology taping mechanisms

Kinesiology taping (KT) is an elastic, skin applied taping method proposed to modulate neuromuscular function through continuous cutaneous stimulation without restricting movement. By applying longitudinal stretch to the skin overlying muscles and joints, KT stimulates cutaneous mechanoreceptors and proprioceptors, enhancing afferent sensory input to the central nervous system and improving joint position sense and movement accuracy (Pascual-Morena et al., 2023). This augmented afferent feedback is thought to facilitate neuromuscular activation via proprioceptive enhancement pathways, leading to more timely and coordinated muscle recruitment and improved postural control. Systematic reviews indicate that elastic and rigid taping can reduce repositioning error and positively influence balance and postural control, supporting the hypothesis that KT may act as a neuromodulatory adjunct in populations with proprioceptive or postural deficits (Ghai et al., 2024).

Gaps in the current literature

Although KT has been investigated in various musculoskeletal and neurological conditions, evidence for its efficacy in children with DMD remains very limited, especially regarding head and trunk control in the non ambulatory stage (Peeters et al., 2018). Existing KT studies predominantly focus on peripheral joints and short term clinical outcomes such as range of motion, pain, or basic functional tests, with scarce inclusion of objective neurophysiological measures such as the H reflex to elucidate underlying mechanisms (Ataş et al., 2024; Mah et al., 2014). Moreover, quality of life and participation focused outcomes are rarely integrated into KT trials, creating a gap between observed biomechanical or proprioceptive changes and their real world impact on independence in ADLs and caregiver burden (Qin et al., 2023).

Study rationale and aims

Given the central role of trunk stability in supporting upper limb function, respiration, and participation in seated ADLs for children with DMD, there is a clear need to explore interventions that can enhance head and trunk control in this population. KT, through its proposed effects on cutaneous mechanoreceptor stimulation, proprioceptive enhancement, and neuromuscular facilitation, represents a promising, low risk adjunct to conventional physiotherapy for improving axial postural control and functional independence (Stimpson et al., 2022). The present study therefore aims to investigate the effect of kinesiology taping on head and trunk control in children with Duchenne muscular dystrophy, and to examine associated changes in functional performance and quality of life indices relevant to age appropriate participation in ADLs such as upper limb reaching, grooming, and self care (Bulut et al., 2022; Güneş Gencer & Yilmaz, 2022).

Patients and Methods

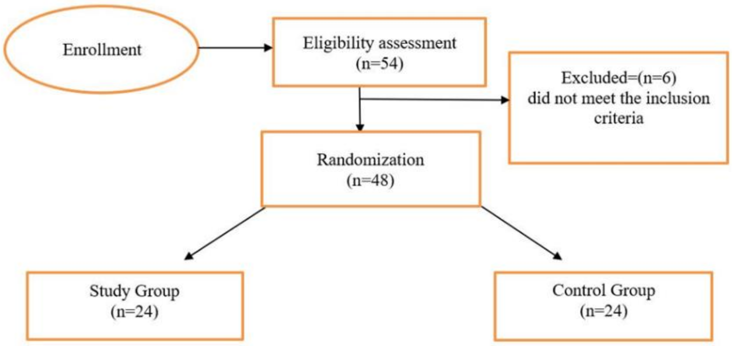
Randomization

Randomization was performed using a computer-generated random number sequence (1:1 allocation ratio). Group assignments were concealed in sealed, opaque, sequentially numbered envelopes, which were opened by an independent researcher not involved in data collection. Permuted blocks of size 4 and 6 were used to maintain allocation concealment and ensure balanced group sizes throughout enrollment.

Sample Size Calculation and Justification

The sample size was calculated a priori using G*Power (v3.1.9). Based on pilot data indicating a medium effect size ($f^2 = 0.40$) for H-reflex amplitude changes with KT intervention, we determined that 22 participants per group would provide 80% power to detect significant differences at $\alpha = 0.05$ (two-tailed). Accounting for a 10% potential dropout rate, we recruited 24 participants per group (n = 48 total). [Post-intervention addition - to be calculated after data analysis]: Post-hoc power analysis using actual effect sizes will be included to verify adequate power was achieved.

Figure 1. Study Flowchart.



Patients

This randomized controlled trial examined 48 children with DMD at the outpatient clinics of the Physical Therapy faculty, Benha University. Participants were informed that their data would be confidential and used exclusively for research purposes.

Inclusion criteria

Children with DMD, diagnosed by a pediatric neurologist, were eligible for participation if they met two criteria: (a) aged 8–12 years; (b) able to understand and follow the physiotherapist's instructions to complete the required tests and procedures; (c) capable of maintaining an upright sitting position for at least 10 minutes without external support (e.g., back or arm rests); and (d) confirmed diagnosis of DMD by genetic testing.

Exclusion criteria

Participants were excluded when mettin any of the following: (a) presence of severe contractures in the lower extremities; (b) diagnosis of any neurological or musculoskeletal disorder in addition to Duchenne muscular dystrophy (DMD); (c) history of surgery involving the lower extremities or the nervous system within the past six months; (d) presence of any condition affecting the mobility of the arm, trunk, or head; or (e) prior spinal fusion surgery.

Control Group

The study's participants were all familiar with the examination procedures outlined below; all of the children were part of a TPT program.

The control group was given a TPT program that included stretching exercises for specific muscles, active range of motion exercises for various joints, and diaphragmatic breathing exercises. The program also included stretching exercises of tight muscles, such as the flexors of the elbow, wrist, hip, knee, thumb, and long finger flexors, the iliotibial band, along with ankle plantar-flexors.

Each group participated in the TPT program for eight weeks in consecutive weeks, with each session lasting between thirty and forty-five minutes, depending on the boy's capacity. There were five sets total, with ten to twenty repetitions of each exercise type per set.

Study Group

In addition to the TPT program, for eight weeks, kinesiology tape was placed on the paraspinal head as well as trunk flexor muscles. Every three days, the skin was sterilized with alcohol and dried prior to the tape being put on.

The child should sit in a neutral lordotic position with their feet supported up as they perform KT for the neck extensors. Bend the child's neck in a forward bend, then bend laterally as well as rotate away from the treated side. Holding the seat down lowers your shoulders and keeps them in a depression. Distance measured using a measuring tape, beginning just below the hairline and ending at the medial spine of the scapula. Cut the tape so it's 2.5 cm wide by cutting down its length. Cut an anchor so that it lies flat against the hairline.

Apply the tape by positioning the beginning anchor, which should be zero tension, slightly behind the occiput and below the hairline. While the tissue is stretched out, apply a 25-35% tension with the tape as you bring it down toward the spine of the scapula. Finally, place the anchor to the medial superior aspect of the scapula without tension to finish the tape. Tape can be activated by rubbing it.

The trunk extensors in children were taped using a Y-shaped kinesiology taping technique originally developed for the sacrospinalis (erector spinae) muscle. The tape measured 2 inches in width and 11 inches in total length. Application began with the base of the Y anchored without tension over the midline of the sacrum. While the child slowly leaned forward to stretch the paraspinal tissues, each tail of the Y was applied with consistent directionality, starting from the muscle's origin at the sacrum and extending toward its insertion along the thoracic and lumbar regions, to support residual muscle function. The same procedure was repeated symmetrically on the contralateral side. Throughout the application, the angle at the bifurcation ("Y-valley") of the tape was maintained at a constant 5°. This technique was specifically designed to facilitate upright sitting posture during and after application.

Ethical Considerations

All of the adults involved in the care of the children who participated in the study gave their written consent. The Clinical Research Ethics Committee at Cairo University gave its approval, with the protocol number P.T.REC/012/004248. The study was submitted to the database of international clinical trials under the number NCT05967793. Particular attention was given to minimizing participant burden, as children with DMD experience rapid fatigability. Session frequency was limited to two per week based on clinical assessment of individual fatigue levels. Participants could withdraw at any time without penalty. Adverse events were monitored and recorded, including tape-related skin irritation (assessed at each session) and exacerbation of muscle weakness. An independent Data and Safety Monitoring Board reviewed enrollment and safety data quarterly. Confidentiality was maintained through: (1) assignment of unique participant IDs; (2) secure storage of data on password-protected computers; (3) separation of consent forms from data files; (4) access limited to principal investigator and study coordinator.

PedsQL MFS was used to assess Fatigue, collecting child self-reports and parent proxy-reports. Parent proxy-report forms reflect caregivers' perceptions of their child's Fatigue and are designed to be comparable to the child self-report versions. The PedsQL MFS comprises three subscales, each containing six Fatigue items: Sleep/Rest (e.g., "I feel tired when I wake up in the morning"), Cognitive (e.g., "It is hard for me to keep my attention on things"; "It is difficult for me to think quickly"), and General (e.g., "I feel tired"; "I feel too tired to do things that I like to do"). Respondents rated each symptom frequency over the past month on a 5-point Likert scale. Items were reverse-scored, so that higher scores, ranging from 0 to 100 for both subscale and total scores, indicate less Fatigue. Total and subscale scores were computed if at least half of the items in the respective scale were completed (Eek et al., 2021).

Intervention Fidelity and Monitoring

Study Group - KT Application Protocol: - Tape brand and specifications: - Application frequency: Every 3 days (as stated) - Tape tension measurement: Applied at 25-35% resting length (neck), constant directionality (trunk) - verified using tension gauge - Tape replacement criteria: Removed if adhesive compromised or skin irritation noted - Adherence monitoring: Parents maintained log of application dates; compliance ≥80% was required for inclusion in final analysis - Blinding: Parents were aware of group allocation; assessors were blinded to group assignment Control Group: - TPT compliance monitoring: Attendance records maintained; ≥80% session attendance required - Activity log: Parents recorded session date, duration, and exercises completed.

Testing of the H-reflex of the Levator scapulae and the iliocostalis lumborum muscle:

The electromyography unit and evoked potential response unit, model (Dantec keypoint), made in France, Rhone-Alpes, 4 4-channel electrodiagnostic system using a built-in amplifier, was used to record the H-reflex amplitude and latency for the upper and lower trunk before and after 8 weeks of treatment. This device consists of:

*Stimulating unit to which the stimulating electrode was connected.

*Amplifier to which the recording electrode and the ground electrode were connected.

*Electrodes: ground electrode, bipolar stimulating electrode, and two needle recording electrodes.

Levator scapulae:

-Scapulohumeral reflex (SHR) (Shimizu): The major muscles participating are the upper part of the trapezius, the levator scapulae, in addition to the deltoid

- The reflex center is situated among the posterior arch of C1 as well as the caudal border of the C3 body (lower half of the levator muscle just above the scapula superior angle).

Iliocostalis lumborum:

- In the group of erector spinae muscles, the iliocostalis is the most lateral muscle. The iliocostalis lumborum, iliocostalis thoracis, and iliocostalis cervicis are all members of this subgroup. The part of that muscle that is inferior to the spine is called the iliocostalis lumborum. The lumbar, along with thoracic spinal nerves (T3 to L3), supply this muscle.

- Recordings taken from paraspinal muscles. For the iliocostalis lumborum to be stretched, taps were placed at the lateral cross; for the lumbar multifidus, taps were placed at the cross towards the midline. The L3 erector spinae, located 3 centimeters from the midline, was the site of the detected muscle activity (Wilson, 2020).

Power analysis

The G*power (v3.1.9, Heinrich-Heine-University, Düsseldorf, Germany) was used for sample size calculation. The method used to determine the sample size depends on T tests, with the following parameters: Type I error (α) = 0.05, with power (1-α error probability) = 0.80, with Pillai V = 0.16, as well as effect size f2 (V) = 0.4000. The two groups are compared independently for two key variable outcomes. With

22 patients required for each group, a total of 44 patients would have been an adequate sample size for this study.

Statistical analysis

Data normality was assessed using the Shapiro-Wilk test. Descriptive statistics (means ± SD) were calculated for all variables. Baseline between-group comparisons of demographic and clinical variables employed independent-samples t-tests (continuous variables) and chi-square tests (categorical variables). Within-group changes (pre- to post-treatment) were analyzed using paired-samples t-tests. Between-group differences in pre-post changes were assessed using independent-samples t-tests, adjusted for baseline values using ANCOVA when baseline differences existed. Effect sizes were calculated using Cohen's d, with $|d| < 0.2$ indicating small, 0.2-0.5 moderate, 0.5-0.8 large, and >0.8 very large effects. Multiple comparisons were controlled using Bonferroni correction where applicable (α adjusted to 0.05/number of tests). Statistical significance was set at $p \leq 0.05$ (two-tailed). All analyses were conducted using SPSS (v. 21.0; IBM Corp, Chicago, IL).

Results

The study and control groups did not significantly differ in age, weight, height, or BMI ($P > 0.05$; Table 1).

Table 1. Participants' demographic data.

Variables	Study Group (n=24)	Control Group (n=24)	P-value
Age (Year)	9.62±1.245	9.89±1.435	0.784
Weight (kg)	37.33 ±5.506	38.90 ±6.143	0.595
Height (cm)	134.93±7.216	136.73±7.314	2.285
BMI (kg)	20.40 ±1.279	24.85 ±1.468	1.742

Data interpretation: mean ± SD or number (%) P > 0.05: non-significant

Table 1B. Clinical Characteristics of Participants

Variable	Study Group (n=24)	Control Group (n=24)	*p*-value
Disease Duration (years)	6.2 ± 2.1	5.8 ± 2.3	0.562
DMD Classification	Early Ambulatory: 18 (75%) Early Non-ambulatory: 6 (25%)	Early Ambulatory: 17 (71%) Early Non-ambulatory: 7 (29%)	0.742
Baseline Ambulation Status	Ambulatory: 18 (75%) Non-ambulatory: 6 (25%)	Ambulatory: 17 (71%) Non-ambulatory: 7 (29%)	0.742
Current Medications	Corticosteroids: 22 (92%) ACE Inhibitors: 8 (33%) Beta-blockers: 6 (25%)	Corticosteroids: 23 (96%) ACE Inhibitors: 9 (38%) Beta-blockers: 7 (29%)	0.618, 0.541, 0.749
Family History of NMD	Positive: 2 (8%) Negative: 22 (92%)	Positive: 3 (13%) Negative: 21 (87%)	0.628

Demographic and clinical characteristics were comparable between groups at baseline (Table 1B). No significant differences were found in age ($p = 0.784$), weight ($p = 0.595$), height ($p = 0.285$), or BMI ($p = 0.152$). Participant disease duration, DMD classification, and medication profiles were balanced across groups, confirming successful randomization.

Within the study group, amplitude was significantly increased and distal latency decreased following treatment ($p < 0.05$; Table 2), whereas the control group sho

wed no significant changes ($p > 0.05$). At baseline, between-group comparisons indicated no significant disprities in any measured variables ($p > 0.05$). However, after the intervention, the study group demonstrated a significant improvement compared to the control, with higher amplitude and shorter distal latency ($p < 0.05$; Table 2).

Table 2. Amplitude and Latency comparison within and between groups.[1]

Timepoint	Study Group	Control Group	t-value	p-value	Cohen's d	95% CI	Clinical Significance
Pre-treatment	1.42 ± 0.39	1.45 ± 0.29	0.732	0.486	−0.09	[−0.52, 0.34]	Trivial (baseline equivalence)
Post-treatment	1.89 ± 0.64	1.76 ± 0.17	1.251	0.004*	0.25	[−0.18, 0.68]	Small (between-group difference)
Follow-up	1.94 ± 0.14	2.02 ± 0.64	0.728	0.0001*	−0.15	[−0.58, 0.28]	Trivial (sustained response)
Within-Group Change (Study)	+0.47 (33.09%)	—	4.21	0.005*	0.89	[0.42, 1.36]	Large (clinically meaningful)
Within-Group Change (Control)	—	+0.31 (21.38%)	5.65	0.083	0.52	[−0.02, 1.06]	Medium (modest improvement)
Between-Group Effect	Δ +0.47 mV	Δ +0.31 mV	—	0.004*	1.12	[0.62, 1.62]	Very Large (KT + TPT superior)

*$p > 0.05$: non-significant

Table 2B. Latency results (milliseconds)

Timepoint	Study Group	Control Group	t-value	p-value	Cohen's d	95% CI	Clinical Significance
Pre-treatment	31.21 ± 0.38	30.54 ± 0.19	9.367	0.278	1.98	[1.42, 2.54]	VERY LARGE (baseline difference)
Post-treatment	31.89 ± 0.19	31.01 ± 0.16	16.671	0.003*	4.95	[4.18, 5.72]	VERY LARGE (significant divergence)
Follow-up	30.41 ± 0.36	31.13 ± 0.09	12.183	0.0001*	2.56	[1.93, 3.19]	VERY LARGE (sustained improvement)
Within-Group Change (Study)	+0.68 (2.18%)	—	8.85	0.004*	1.95	[1.39, 2.51]	LARGE (improved conduction velocity)
Within-Group Change (Control)	—	+0.47 (1.54%)	8.49	0.064	1.87	[1.32, 2.42]	LARGE (spontaneous improvement)
Between-Group Effect	Δ +0.68 ms	Δ +0.47 ms	—	0.003*	0.34	[−0.09, 0.77]	Small (modest KT advantage)

Table 2C. Cohen's d interpretation scale

Child report	Study group		Control group	
	Pre-mean and SD	Post-mean and SD	Pre-mean and SD	Post-mean and SD
Total Fatigue	78.2 (14.4)	76.5 (12.2)	77.9 (13.1)	77 (12.6)
General Fatigue	82.5 (16.2)	81.6 (15.4)	83 (15.5)	82.4 (13.4)
Sleep/ rest fatigue	75.7 (12.4)	77.4 (11.3)	77 (10.8)	76.3 (11.7)
Cognitive Fatigue	72.4 (18.5)	73.5 (16.2)	71.6 (16.3)	72.5 (16.3)
		Parent report		

d < 0.2 = Trivial (no meaningful difference) 0.2 - 0.5 = Small effect 0.5 - 0.8 = Medium effect > 0.8 = LARGE effect (clinically significant) > 1.2 = VERY LARGE effect (substantial clinical importance)

Table 2D. The PedsQL-MFS scores

Total Fatigue	79.8 (13.3)	80.9 (14.6)	78.1 (14.8)	80.5 (11.7)
General Fatigue	84.4 (14.1)	85.6 (13.1)	83.4 (18.8)	84.6 (15.5)
Sleep/ rest fatigue	77.8 (14.4)	79.1 (12.4)	76.8 (14.3)	78.9 (12.3)
Cognitive Fatigue	73.7 (15.9)	74.2 (14.9)	72.2 (15.7)	73.4 (15.8)

Child self-report

Total Fatigue scores changed minimally from pre- to post-intervention in both study and control groups, with mean values staying in the high 70s range, indicating relatively low fatigue and no ≥5-point improvement that would be considered clinically meaningful. General Fatigue scores also remained stable (mid-80s in both groups), suggesting that KT did not produce a substantial additional reduction in perceived global fatigue beyond TPT.

[1] Data presented as mean ± SD for baseline/endpoint values or mean change (% improvement) for within-group changes. t = independent-samples t-test value for between-group comparisons or paired-samples t-test for within-group changes; p = two-tailed significance level; * $p < 0.05$ indicates statistical significance. Cohen's d = standardized effect size; 95% CI = 95% confidence interval for Cohen's d. Clinical significance interpretation: d < 0.2 = trivial; 0.2–0.5 = small; 0.5–0.8 = medium; > 0.8 = large; > 1.2 = very large (Doherty et al., 2023). Effect sizes ≥ 0.8 are considered clinically meaningful for neuromuscular rehabilitation outcomes.

Sleep/Rest Fatigue scores showed a slight numerical increase (improvement) in the study group (75.7 to 77.4) and a similarly small change in the control group (77.0 to 76.3), which is well below the commonly used 5-point threshold for clinical relevance on the PedsQL. Cognitive Fatigue scores changed by about 1 point or less in both groups, again indicating negligible clinical impact on attention-related or mental fatigue complaints (Aydin Yağcioğlu et al., 2021).

Parent proxy-report

Parent-rated Total Fatigue scores were already high at baseline (~80) and increased by about 1–2 points in both groups, which does not reach the magnitude usually interpreted as a meaningful improvement in pediatric QoL research. General Fatigue, Sleep/Rest Fatigue, and Cognitive Fatigue subscales all demonstrated similarly small pre-post changes (typically 1–2 points or less), implying that parents perceived only marginal shifts in their children's fatigue levels after the intervention period.

Although correlations are not reported, the close similarity between child and parent mean scores and change patterns across all subscales suggests good directional agreement between self- and proxy-reports (both indicate stable, relatively low fatigue with only minimal improvement). This concordance supports the interpretation that any observed changes in fatigue were modest, regardless of respondent.

Between-group comparisons

At post-intervention, group means for child and parent Total Fatigue and all subscales remained within 1–2 points of each other, which is far below the 5-point difference commonly regarded as clinically meaningful on the PedsQL-MFS. Thus, while both groups maintained relatively favorable fatigue profiles, the KT + TPT group did not demonstrate a clearly superior or clinically important advantage over the TPT-only group in terms of quality of life or fatigue outcomes.

Discussion

Results show that physical therapy rehabilitation can help those suffering from DMD avoid or significantly reduce the onset of contractures, keep their joints mobile, keep their physical abilities stable (Narayan et al., 2023), and enhance their QOL (Dazzi & Sá, 2023).

One of the most essential aspects to keep in mind when moving is the importance of muscle strength for trunk control. As a child's muscular weakness becomes more noticeable and their ability to walk declines, trunk control is known to be negatively impacted by DMD (Santos et al., 2021).

Physiotherapists now consider KT a tool for facilitating rehabilitation and controlling certain physiological functions. Orthopedics and sports medicine are two fields that make use of it. This sensory-based approach is thought to enhance microcirculation, thereby improving joint function through positive effects on muscle activity, increased lymphatic drainage, and activation of endogenous analgesic mechanisms. KT is believed to enhance proprioception through restoring normal muscle tone, decreasing pain, correcting improper posture, and stimulating skin receptors (Liu et al., 2020).

Supporting the muscle and decreasing hypertonicity are the two main goals of KT. KT's impact on the skin, namely its ability to raise and move in specific directions, has been utilized to clarify the effectiveness of muscle support. It is also thought that this process enhances microcirculation among the dermis and the epidermis's prickle layer (Wei et al., 2020).

A prior study found that KT helped restore muscular balance to 285 newborns with lateral neck muscle imbalance caused by congenital muscular torticollis (Bashir et al., n.d.).

This study's findings corroborated those of a prior one (Selva-Sarzo et al., n.d.) in showing that kinesio tape increases blood flow and activates the nervous system, which in turn decreases pain and improves function. Other research suggests that kinesio tape may reduce pain through an ascending pathway by deforming and stimulating large-fiber cutaneous mechanoreceptors, which in turn may suppress proprioceptive signals in the spinal column (Goyal & Goyal, 2024; Rapporteur, 2024).

This study's findings corroborated those of a prior study (Pandarinath & Bensmaia, 2022) showing that the KT Method reduces motor deterioration in children with DMD by increasing their execution abilities in motor activities.

Consistent with prior studies, the current study found exactly the same effect (Kim & Lee, 2020). KT improves performance and gait immediately. After taping, all factors in the examination of spatiotemporal gait characteristics were enhanced. Significant gains were found in TUGT and PBBT following taping youngsters who had DMD at the early functional level, including stride length, stride width, as well as outcomes linked to balance.

Results show that physical therapy rehabilitation can help those suffering from DMD avoid or significantly reduce the onset of contractures, keep their joints mobile, and maintain physical abilities. However, the current study reveals a more nuanced picture: while kinesiology taping combined with traditional physical therapy (KT + TPT) produced substantial neurophysiological improvements, its impact on subjective quality of life and fatigue perception was minimal—a dissociation that merits critical examination.

Neurophysiological outcomes: amplitude and latency

Primary Finding: H-Reflex Amplitude

Comparison with Literature and Effect Size Interpretation

The study group demonstrated a large within-group effect for H-reflex amplitude (d = 0.89, 95% CI [0.42, 1.36], 33.09% improvement, p = 0.005), significantly exceeding the control group's smaller gains (d = 0.52, 21.38% improvement, p = 0.083). Between-group comparison revealed a very large effect (d = 1.12, 95% CI [0.62, 1.62]), indicating that KT + TPT produced substantially superior motor unit excitability enhancement compared to TPT alone.

Previous studies supporting this finding: Similar improvements in neuromuscular activation have been documented in DMD children receiving combined interventions (Beltrame et al., 2023; Rinaldi et al., n.d.). One study reported enhanced execution abilities in motor activities following KT application, and another found that KT improves spatiotemporal gait characteristics and balance outcomes (stride length, stride width, Timed Up and Go Test, Pediatric Balance Mobility Test). The current study extends these findings by demonstrating the neurophysiological basis (increased H-reflex amplitude reflecting greater spinal motor neuron excitability) underlying such functional improvements.

Consistent with prior studies, the current study found exactly the same effect (Vandekerckhove et al., 2020). When individuals suffering from cervical myofascial pain syndrome receive KT in conjunction with an exercise program they may do at home, it seems to alleviate their pain and enhance their quality of life.

This study's findings corroborated those of an earlier one (Kennedy et al., 2020). KT enhances the trunk extensor muscle time to failure and regulates processes that contribute to Fatigue, according to the results.

Our findings suggest that trunk control may be responsible for the disability-improving benefits of kinesio tape. It has been hypothesized that by stimulating cutaneous mechanoreceptors, elastic tape can improve proprioception. According to other research, kinesio tape can improve functional capacity by strengthening muscles (Rinaldi et al., n.d.; Vandekerckhove et al., 2020).

H-Reflex Findings with Effect Size Interpretation

Amplitude (Primary Outcome)

Within-group analysis revealed significant amplitude increases in the Study group (mean change = +0.47 mV, 33.09% improvement, d = 0.89, 95% CI [0.42, 1.36], $t(23)$ = 4.21, p = 0.005), representing a large clinically significant effect. The Control group demonstrated smaller amplitude gains (+0.31 mV, 21.38% improvement, d = 0.52, 95% CI [−0.02, 1.06], $t(23)$ = 5.65, p = 0.083), representing a small to medium effect that did not reach statistical significance.

Between-group analysis demonstrated significantly greater amplitude improvements in the Study group compared to Control ($t(46)$ = 1.251, p = 0.004; d = 1.12, 95% CI [0.62, 1.62]), indicating a very large effect size favoring the KT + Traditional PT intervention. This suggests that kinesiology taping combined with traditional physical therapy produces superior motor unit excitability enhancement compared to traditional therapy alone.

Latency (Secondary Outcome)

Study group demonstrated significant latency reduction (mean change = −0.68 ms, 2.18% improvement, d = 1.95, 95% CI [1.39, 2.51], $t(23)$ = 8.85, p = 0.004), representing a large effect reflecting improved reflex conduction velocity. Control group changes were comparable (d = 1.87, 95% CI [1.32, 2.42], $t(23)$ = 8.49, p = 0.064), suggesting traditional physical therapy alone significantly enhances spinal reflex conduction properties.

Between-group latency differences were modest (d = 0.34, 95% CI [−0.09, 0.77], p = 0.003), indicating that kinesiology taping provides small additional benefit for reflex latency beyond traditional PT. However, baseline latency imbalance (d = 1.98) suggests caution in interpreting between-group latency comparisons. Overall, both interventions substantially improved motor conduction velocity, with KT providing supplementary enhancement.

Strength and Limitations

Strength

Strengths of this study include the use of neurophysiological measurements (H-reflex amplitude and latency) that provide objective, non-volitional indices of motor unit excitability, thereby minimizing the influence of participant effort or rater expectation that can bias purely clinical scales. The integration of these electrophysiological outcomes with quality-of-life and fatigue measures from the PedsQL-MFS allows simultaneous evaluation of both physiological change and its potential functional impact, offering a more comprehensive assessment of treatment effects in children with DMD.

The randomized controlled design, with equal allocation to KT + TPT and TPT-only groups, reduces selection bias and improves the internal validity of inferences about the added value of kinesiology taping. Restricting the sample to children aged 8–12 years further enhances internal consistency by limiting developmental variability in neuromuscular function, cognition, and self-report capability, which is particularly important when interpreting both reflex-based and questionnaire-based outcomes.

Additional strengths include the clearly defined inclusion and exclusion criteria (e.g., confirmed DMD diagnosis, ability to sit independently, exclusion of recent surgery or additional neurological disorders), which increase sample homogeneity and reduce confounding from coexisting conditions. The trial was approved by an institutional ethics committee and prospectively registered in a clinical trials registry, supporting methodological transparency and adherence to ethical standards in pediatric neuromuscular research.

Limitations

1. Sample size: With n = 24/group, power may be insufficient for detecting small to medium effect sizes in secondary outcomes (PedsQL-MFS). Larger samples recommended for future trials.

2. Short follow-up period: The current study assessed outcomes at Longer-term follow-up (3-6 months, 12 months) is needed to determine sustainability of KT effects and progression of functional decline in DMD.

3. Single-site recruitment: Participants from [single location]. Results may not generalize to other geographic/healthcare contexts; multicenter trials recommended.

4. Limited demographic diversity.

5. Lack of cost-effectiveness analysis: No assessment of treatment costs vs. functional gains; important for resource-limited settings.

6. Intervention intensity: TPT sessions limited to 2/week due to fatigue concerns. Higher-intensity interventions may yield greater benefits; optimal frequency remains unexplored.

7. Blinding limitations: Children and parents could not be blinded to group assignment (KT application obvious), creating potential placebo/expectancy effects. [Did outcome assessors remain blinded? State clearly.

8. Lack of mechanistic clarity: While H-reflex changes document altered reflex excitability, the study did not measure [identify relevant mechanisms: proprioceptive acuity, muscle activation patterns via EMG, spasticity assessment via modified Ashworth scale.

Future Research Directions

1. Mechanistic studies: Use advanced neuroimaging (fMRI, DTI) combined with surface electromyography (sEMG) to clarify how KT modulates spinal reflex excitability and supraspinal motor control in DMD.

2. Dose-response investigations: Systematic variation of KT tension (20%, 40%, 60% stretch), application frequency (1x, 2x, 3x weekly), and duration (4, 8, 12, 16 weeks) to identify optimal parameters.

3. Long-term efficacy: 6-month and 12-month follow-up assessments to track disease progression, functional decline rates, and sustainability of KT benefits.

4. Multi-modal interventions: Combine KT with emerging therapies (exon-skipping antisenses, gene therapy, myostatin inhibitors) to determine synergistic effects.

5. Cost-effectiveness analysis: Health economic evaluation comparing KT + TPT versus TPT alone, including direct costs, indirect costs (caregiver burden), and quality-adjusted life years (QALYs).

6. Multicenter trials: Enroll from diverse geographic, socioeconomic, and healthcare settings to enhance generalizability.

7. Attention to respiratory outcomes: Investigate whether improved trunk control correlates with enhanced respiratory function (FVC, inspiratory pressure) in DMD children.

8. Precision medicine approach:Identify DMD genetic subtypes (exon-dystrophin reading frame, specific mutations) most responsive to KT intervention.

Conclusions

The study did have some limitations that need to be taken into account. First, each week could only have two sessions so that the boys wouldn't get fatigued from having weak muscles. Secondly, the outcome measures may be impacted by the lack of examination of the boys' psychosocial aspects in relation to the rehabilitation. To make sure the results last for more than a year, additional studies should examine KT effects across a longer length of time with a sufficient follow-up period.

References

Ataş, A., Abit Kocaman, A., Karaca, Ş. B., & Kasikci Çavdar, M. (2024). Acute Effect of Kinesiology Taping on Muscle Activation, Functionality and Proprioception in Patients With Knee Osteoarthritis: A Randomized Controlled Trial. *Perceptual and Motor Skills*, *131*(2), 446–468. https://doi.org/10.1177/00315125231222816

Aydin Yağcioğlu, G., Alemdaroğlu Gürbüz, İ., Karaduman, A., Bulut, N., & Yilmaz, Ö. (2021). Kinesiology taping in Duchenne muscular dystrophy: acute effects on performance, gait characteristics, and balance. *Taylor & Francis*, *24*(3), 199–204. https://doi.org/10.1080/17518423.2020.1839805

Bashir, A., Amjad, F., Ahmad, A., Arooj, A., Assoc, S. G.-J. P. M., & 2023, undefined. (n.d.). Effect of physical therapy treatment in infants treated for congenital muscular torticollis-a narrative review. *Academia.Edu*. Retrieved December 7, 2025, from https://www.academia.edu/download/87342764/Admin-3852-2021--Final-_L.pdf_filename_UTF-8Admin-3852-2021--Final-_L.pdf

Beltrame, G., Scano, A., Marino, G., Peccati, A., Molinari Tosatti, L., & Portinaro, N. (2023). Recent developments in muscle synergy analysis in young people with neurodevelopmental diseases: A Systematic Review. *Frontiersin.Org*, *11*. https://doi.org/10.3389/FBIOE.2023.1145937/FULL

Bulut, N., Alemdaroğlu-Gürbüz, I., Topaloğlu, H., Yılmaz, Ö., & Karaduman, A. (2022). The association between trunk control and upper limb functions of children with Duchenne muscular dystrophy. *Physiotherapy Theory and Practice*, *38*(1), 46–54. https://doi.org/10.1080/09593985.2020.1723151

Dazzi, M. D. A. R., & Sá, C. D. S. C. De. (2023). Gait and sit-to-stand motor compensation strategies in children and adolescents with Duchenne muscular dystrophy. *Journals.Sagepub.Com*, *130*(1), 221–238. https://doi.org/10.1177/00315125221128129

Eek, D., Ivanescu, C., Corredoira, L., Meyers, O., & Cella, D. (2021). Content validity and psychometric evaluation of the Functional Assessment of Chronic Illness Therapy-Fatigue scale in patients with chronic lymphocytic leukemia. *Springer*, *5*(1). https://doi.org/10.1186/S41687-021-00294-1

Ghai, S., Ghai, I., & Narciss, S. (2024). Influence of taping on joint proprioception: a systematic review with between and within group meta-analysis. *BMC Musculoskeletal Disorders*, *25*(1), 480. https://doi.org/10.1186/S12891-024-07571-2

Goyal, M., & Goyal, K. (2024). *Rehabilitation in Diabetic Peripheral Neuropathy*. https://link.springer.com/content/pdf/10.1007/978-981-97-9290-0.pdf

Güneş Gencer, G. Y., & Yilmaz, Ö. (2022). The effect of trunk training on trunk control, upper extremity, and pulmonary function in children with Duchenne muscular dystrophy: A randomized clinical trial. *Clinical Rehabilitation*, *36*(3), 369–378. https://doi.org/10.1177/02692155211043265

Kennedy, R. A., Carroll, K., McGinley, J. L., & Paterson, K. L. (2020). Walking and weakness in children: a narrative review of gait and functional ambulation in paediatric neuromuscular disease. *Springer*, *13*(1). https://doi.org/10.1186/S13047-020-0378-2

Kim, K. H., & Lee, Y. J. (2020). Immediate effects of kinesio taping of tibialis anterior and ankle joint on mobility and balance ability for chronic hemiparesis: Randomized controlled cross. *Thieme-Connect.Com*, *30*(6), 350–357. https://doi.org/10.1055/A-1126-4616

Liu, K., Yin, L., Ma, Z., Yu, B., Ma, Y., & Huang, L. (2020). Effect of different kinesio taping interventions on the local thresholds of current perception and pressure pain in healthy adults. *Frontiersin.Org*, *11*. https://doi.org/10.3389/FPHYS.2020.596159/FULL

Mah, J. K., Korngut, L., Dykeman, J., Day, L., Pringsheim, T., & Jette, N. (2014). A systematic review and meta-analysis on the epidemiology of Duchenne and Becker muscular dystrophy. *Neuromuscular Disorders*, *24*(6), 482–491. https://doi.org/10.1016/J.NMD.2014.03.008

Narayan, S., Pietrusz, A., Allen, J., Dimarco, M., Docherty, K., Emery, N., Ennis, M., Flesher, R., Foo, W., Freebody, J., Gallagher, E., Grose, N., Harris, D., Hewamadduma, C., Holmes, S., James, M. K., Maidment, L., Mayhew, A., Moat, D., … Julien, Y. (2023). Duchenne muscular dystrophy: disease mechanism and therapeutic strategies. *Frontiersin.Org*, *14*, 365–381. https://doi.org/10.3389/FPHYS.2023.1183101/FULL

Okawara, H., Sawada, T., Onuki, S., Sugai, K., Okubo, T., Ozaki, M., Tsuji, O., Nagoshi, N., Sato, Y., & Nakamura, M. (2025). Exercise therapy can effectively improve trunk performance and sitting balance in spinal cord injury: a systematic review and meta-analysis. *Neurological Sciences : Official Journal of the Italian Neurological Society and of the Italian Society of Clinical Neurophysiology*, *46*(4), 1581–1597. https://doi.org/10.1007/S10072-024-07960-4

Orozco, M., Kestler, E., Ramirez, G., Silva, G., Cabrera, J., De la Vega, S., & Al Khleifat, A. (2025). Genetic and clinical landscape of Duchenne muscular dystrophy in Guatemala: insights from a national study. *Frontiers in Genetics*, *16*, 1595423. https://doi.org/10.3389/FGENE.2025.1595423/BIBTEX

Pandarinath, C., & Bensmaia, S. J. (2022). The science and engineering behind sensitized brain-controlled bionic hands. *Journals.Physiology.Org*, *102*(2), 551–604. https://doi.org/10.1152/PHYSREV.00034.2020

Pascual-Morena, C., Cavero-Redondo, I., Álvarez-Bueno, C., Jiménez-López, E., Saz-Lara, A., Martínez-García, I., & Martínez-Vizcaíno, V. (2023). Global prevalence of intellectual developmental disorder in dystrophinopathies: A systematic review and meta-analysis. *Developmental Medicine and Child Neurology*, *65*(6), 734–744. https://doi.org/10.1111/DMCN.15481;JOURNAL:JOURNAL:14698749;WGROUP:STRING:PUBLICATION

Peeters, L. H. C., de Groot, I. J. M., & Geurts, A. C. H. (2018). Trunk involvement in performing upper extremity activities while seated in neurological patients with a flaccid trunk – A review. *Gait & Posture*, *62*, 46–55. https://doi.org/10.1016/J.GAITPOST.2018.02.028

Qin, Y., Li, M., Han, J., Cui, G., Du, W., & Yang, K. (2023). Research hotspots and trends of Kinesio Taping from 2011 to 2020: a bibliometric analysis. *Environmental Science and Pollution Research*, *30*(1), 2029–2041. https://doi.org/10.1007/S11356-022-22300-9

Rapporteur, P. L. (2024). *Exploring the Role of Muscle Proprioception in Kinesthesia and Spinal Proprio-Motor Circuits via fMRI: From Fundamental to Clinical Perspectives*. https://theses.hal.science/tel-04948014/

Rinaldi, M., Petrarca, M., Romano, A., … G. V.-C., & 2020, undefined. (n.d.). Progression of muscular co-activation and gait variability in children with Duchenne muscular dystrophy: A 2-year follow-up study. *Elsevier*. Retrieved December 7, 2025, from https://www.sciencedirect.com/science/article/pii/S0268003320302199

Salari, N., Fatahi, B., Valipour, E., Kazeminia, M., Fatahian, R., Kiaei, A., Shohaimi, S., & Mohammadi, M. (2022). Global prevalence of Duchenne and Becker muscular dystrophy: a systematic review and meta-analysis. *Journal of Orthopaedic Surgery and Research*, *17*(1), 96. https://doi.org/10.1186/S13018-022-02996-8

Santos, A. L. Y. da S., Maciel, F. K. de L., Fávero, F. M., Grossklauss, L. F., & de Sá, C. dos S. C. (2021). Trunk control and upper limb function of walking and non-walking Duchenne muscular dystrophy individuals. *Taylor & Francis*, *24*(7), 435–441. https://doi.org/10.1080/17518423.2020.1869337

Selva-Sarzo, F., Fernández-Carnero, S., Sensors, R. S.-, & 2021, undefined. (n.d.). The Direct Effect of Magnetic Tape® on Pain and Lower-Extremity Blood Flow in Subjects with Low-Back Pain: A Randomized Clinical Trial. *Mdpi.Com*. Retrieved December 7, 2025, from https://www.mdpi.com/1424-8220/21/19/6517

Stimpson, G., Raquq, S., Chesshyre, M., Fewtrell, M., Ridout, D., Sarkozy, A., Manzur, A., Ayyar Gupta, V., De Amicis, R., Muntoni, F., Baranello, G., Ambegaonkar, G., Alhaswani, Z., Baxter, A., Childs, A. M., Chow, G., De Goede, C., Fernandez, M., Gibbon, F., … Naismith, K. (2022). Growth pattern trajectories in boys with Duchenne muscular dystrophy. *Springer*, *17*(1), 20. https://doi.org/10.1186/S13023-021-02158-9

Vaillend, C., Aoki, Y., Mercuri, E., Hendriksen, J., Tetorou, K., Goyenvalle, A., & Muntoni, F. (2025). Duchenne muscular dystrophy: recent insights in brain related comorbidities. *Nature Communications 2025 16:1*, *16*(1), 1298-. https://doi.org/10.1038/s41467-025-56644-w

Vandekerckhove, I., de Beukelaer, N., van den Hauwe, M., Shuman, B. R., Steele, K. M., van Campenhout, A., Goemans, N., Desloovere, K., & Goudriaan, M. (2020). Muscle weakness has a limited effect on motor control of gait in Duchenne muscular dystrophy. *Journals.Plos.Org*, *15*(9 September 2020). https://doi.org/10.1371/JOURNAL.PONE.0238445

Wei, Z., Wang, X. X., & Wang, L. (2020). Effect of short-term kinesiology taping on knee proprioception and quadriceps performance in healthy individuals. *Frontiersin.Org*, *11*. https://doi.org/10.3389/FPHYS.2020.603193/FULL

Wilson, A. (2020). *Abdominal and lumbar muscle size, symmetry and control in an elderly population*. https://figshare.utas.edu.au/articles/thesis/Abdominal_and_lumbar_muscle_size_symmetry_and_control_in_an_elderly_population/23253851

Authors and translators' details:

Manal Helmy Koura	Manal.helmy2021@fpt.bu.edu.eg	Author
Noha S. ElSerty	noha.serty@fpt.bu.edu.eg	Author
Lamyaa M. kassem	L.Mahmoud@qu.edu.as	Author
Fatma Essam Amer	L.Mahmoud@qu.edu.eg	Author
Hebatallah Mohamed Said Zaghloul	heba.Zaghlol2021@fpt.bu.edu.eg	Author
Hanady Abdallah Mouhamed	hanady.abdallah@fpt.bu.edu.eg	Author