

Immediate Effects of Kinesio Taping on Diaphragm Excursion, Pulmonary Function, and Aerobic Capacity in Healthy Young Males: A Randomized Controlled Trial

<https://doi.org/10.32337/KACPT.2025.13.3.65>

대한심장호흡물리치료학회지 제13권 제3호 2025, PP.65-71

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Purpose: Kinesio taping (KT) is used to enhance muscle performance and proprioception. However, its respiratory benefits remain unclear. Therefore, the present study examined the immediate effects of KT applied to inspiratory muscles on diaphragm movement, lung function, and aerobic capacity in healthy young males. **Methods:** Thirty seven healthy males were randomly assigned to the respiratory muscle taping (RMT) group (n=19) or control muscle taping (CMT) group (n=18). KT was applied to the diaphragm and accessory inspiratory muscles in the RMT group and nonrespiratory muscles in the CMT group. The diaphragm movement distance (DMD), maximal aerobic capacity (MAC), forced vital capacity (FVC), slow vital capacity (SVC), maximal inspiratory pressure (MIP), and maximal expiratory pressure (MEP) were measured before and after the intervention. Paired and independent t tests were used to perform within and between group comparisons. **Results:** The baseline characteristics did not differ between groups ($p>.05$). No significant prepost changes were observed in any variable for either group ($p>.05$). Moreover, postintervention comparisons showed no significant differences in DMD, MAC, FVC, SVC, MIP, or MEP between groups ($p>.05$). **Conclusion:** Short term KT on inspiratory muscles did not significantly improve diaphragm excursion, lung capacity, respiratory pressure, or aerobic performance in healthy young males. These findings suggest that KT has limited immediate respiratory benefits in this population, highlighting the need for longer intervention studies across diverse groups.

Key words: Kinesio Taping; Respiratory Muscles; Pulmonary Function; Aerobic Capacity; Diaphragm

Received: July 16, 2025 / **Revised:** August 06, 2025 / **Accepted:** August 07, 2025

I. Introduction

The respiratory system is fundamental to human survival, enabling oxygen uptake and carbon dioxide elimination to sustain cellular metabolism (McLafferty et al., 2013). Efficient ventilation depends on the coordinated function of the lungs, diaphragm, thoracic cage, and accessory respiratory muscles (Aliverti, 2016). When this integrated “respiratory pump” is compromised—whether through chronic disease, neuromuscular dysfunction, trauma, or physical deconditioning—individuals frequently experience reduced lung volumes, diminished exercise tolerance, and a decline in overall quality of life (Haas et al., 1985; Markov et al., 2001; Wang et al., 2020).

Conventional respiratory muscle training (RMT) using threshold or impedance loading devices has been shown to

improve key parameters such as forced vital capacity (FVC), slow vital capacity (SVC), and maximal inspiratory pressure (MIP). However, its broader clinical adoption remains limited due to factors such as patient discomfort, time requirements, and lack of immediate performance feedback (Markov et al., 2001; Wang et al., 2020). These limitations have driven interest in adjunctive approaches that are non-invasive, well-tolerated, and capable of enhancing respiratory function with minimal training burden.

Kinesio Taping (KT) was originally developed to mimic the elasticity and thickness of human skin, and is thought to promote cutaneous circulation, lymphatic drainage, and proprioceptive feedback by gently lifting the epidermis (Kase et al., 2003; Oğuz et al., 2021). While KT is widely utilized in musculoskeletal rehabilitation and athletic performance enhancement (Watcharakhueankhan et al.,

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2022), its application in respiratory care has only recently emerged as an area of investigation.

Evidence regarding KT’s respiratory effects remains inconsistent. Several studies have reported that KT applied to the diaphragm or thoracic cage can improve chest wall expansion, oxygen saturation, and dyspnea in patients with chronic obstructive pulmonary disease(COPD)(Arslan et al., 2018; Metin Ökmen et al., 2020; Tomruk et al., 2020; Zeng et al., 2021). Additional findings in sedentary adults and stroke survivors suggest acute improvements in aerobic capacity, increases in maximal inspiratory pressure(MIP), and reductions in respiratory muscle stiffness(Arslan et al., 2018; Wang et al., 2017). However, a recent systematic review and meta-analysis(de Campos et al., 2023) found no significant differences between KT and control groups in forced expiratory volume in the first second(FEV₁), forced vital capacity(FVC), the FEV₁/FVC ratio, or peak expiratory flow(PEF) among individuals with COPD, concluding that current evidence does not support KT as an effective means to improve pulmonary function in this population. Such discrepancies may reflect small sample sizes, heterogeneous taping protocols, and varied outcome measures, making it difficult to reach a definitive conclusion about KT’s respiratory benefits.

Moreover, the majority of prior work has evaluated either static pulmonary parameters or dynamic performance in isolation, limiting a comprehensive understanding of KT’s influence on respiratory mechanics under functional conditions(Metin Ökmen et al., 2020; Temel Aksu et al., 2023). The conflicting evidence base underscores the need for well-controlled studies that simultaneously assess diaphragm excursion, lung volumes, respiratory pressures, and exercise capacity in healthy individuals.

Accordingly, the present study aimed to investigate the acute effects of KT applied to the primary and accessory inspiratory muscles on diaphragm movement distance(DMD), lung volumes and pressures(FVC, SVC, MIP, and MEP), and maximal aerobic capacity(MAC) in healthy young adults. By simultaneously evaluating static pulmonary parameters, respiratory muscle strength, and high-intensity exercise performance, this study sought to provide a more comprehensive understanding of KT’s potential role in respiratory function enhancement.

II. Methods

1. Participants

This study recruited 37 healthy adult male. Prior to participation, all individuals received a detailed explanation of the study procedures and provided written informed consent. Participants were then randomly assigned to one of two groups: the experimental group(n = 19), which received kinesio taping(on the respiratory muscles, and the control group(n = 18), which received kinesio taping on the gastrocnemius muscle(Table 1). The present study was conducted in accordance with the ethical standards set forth in the Declaration of Helsinki, ensuring adherence to internationally recognized principles for research involving human participants. To be eligible for inclusion, participants were required to have no known respiratory or cardiovascular diseases and no history of musculoskeletal disorders that could affect respiratory function. Exclusion criteria included a history of ophthalmic, open-heart, or abdominal surgery; stroke; myocardial infarction; pneumothorax; or aortic aneurysm within the previous three months. Individuals with conditions that could impair respiratory function, such as moyamoya disease or spontaneous pneumothorax, were also excluded. Additional exclusion criteria included active tuberculosis, recent exposure to respiratory infections, a history of massive hemoptysis within the past month, and resting systolic blood pressure exceeding 200 mmHg or diastolic pressure exceeding 140 mmHg. Participants who had engaged in high-intensity exercise within the 48 hours prior to testing were also excluded. Before beginning the experimental procedures, each participant’s height and weight were measured using a standardized height-weight scale.

Table1. General characteristics of participants (n=37)

	Control group (n=18)	Experimental group (n=19)	t	p
Age (years)	21.38±2.06	20.68±1.79	1.09	0.25
Height (cm)	173.61±5.06	174.42±6.19	-0.45	0.65
Weight (kg)	70.88±8.18	74.47±8.44	-1.41	0.15

2. Experimental Procedures

The study was conducted over a two-week period to minimize the effects of muscle fatigue and ensure accurate data collection. Each participant attended one session per week, during which various physiological measurements were taken before and after the application of kinesio taping. During the first week, participants underwent baseline assessments of pulmonary function and diaphragm mobility. The experimental group first completed spirometry tests to measure lung capacity, followed by ultrasound imaging to evaluate diaphragm movement—all conducted without kinesio taping. After these initial assessments, kinesio tape was applied to the respiratory muscles, and the same tests were repeated. Finally, participants performed a shuttle run test to assess aerobic capacity. The control group followed the same procedure but received kinesio taping on the gastrocnemius muscle instead of the respiratory muscles. In the second week, both groups repeated the shuttle run test with kinesio taping applied according to their group assignment, in order to assess any potential changes in aerobic performance.

3. Kinesio taping protocol

In the experimental group, kinesio taping was applied to

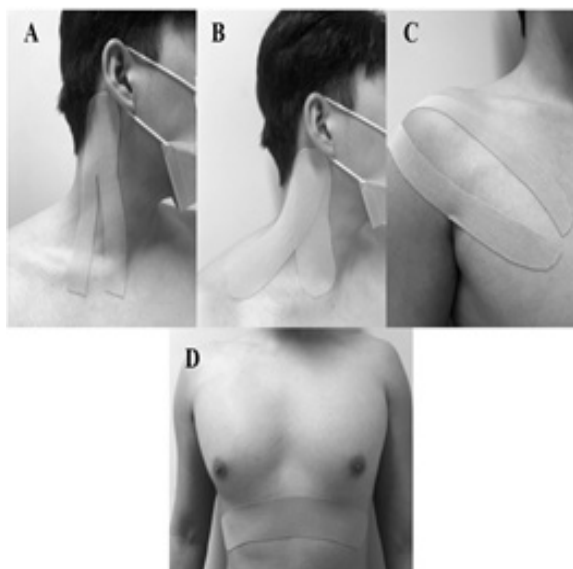


Figure 1. Respiratory muscle taping

A: Sternocleidomastoid, B: Scalene, C: Pectoralis minor, D: Diaphragm

four key respiratory muscles (Figure 1). Sternocleidomastoid (SCM): A Y-shaped kinesio tape was applied with the base anchored at the mastoid process. The two strips were extended along the muscle fibers toward the sternal and clavicular heads while the participant turned their head to the opposite side and slightly tilted it downward. Scalene Muscles: An I-shaped tape was applied from the transverse processes of the C3-C4 vertebrae, extending downward to the first and second ribs while the participant rotated their head to the opposite side. Pectoralis Minor: A Y-shaped tape was anchored at the coracoid process as the participant performed maximal inhalation and shoulder retraction. The tape was then applied in a slightly fanned manner toward the sternal region. Diaphragm: Tape was applied along the lower costal margin, extending from the xiphoid process laterally toward the lower ribs, while the participant was in maximal exhalation. The control group received kinesio taping on the calf muscles, extending from the heel to the proximal gastrocnemius, to control for placebo effects associated with taping (Figure 2).

4. Outcome Measures

Pulmonary function was assessed using a spirometer, measuring several key parameters. Forced Vital Capacity (FVC) was used to determine the maximum volume of air forcibly exhaled after a maximal inhalation. Slow Vital Capacity (SVC) was measured to evaluate the maximum volume of air exhaled without forced effort. In addition, Maximum Inspiratory Pressure (MIP) and Maximum



Figure 2. Calf muscles taping

Expiratory Pressure(MEP) were assessed to evaluate the strength of the inspiratory and expiratory muscles, respectively. Each participant completed three trials for each spirometric measurement, and the highest value was recorded for analysis. Participants were instructed to sit upright, use a nose clip, and place their lips securely around the mouthpiece to ensure accuracy. They were then asked to breathe normally a few times, followed by a deep inhalation and a forceful, sustained exhalation lasting at least six seconds. Diaphragm movement was evaluated using ultrasound imaging. Participants were positioned in a supine position with knees and hips flexed. A 3.5–5.0 MHz ultrasound probe was placed at the costal margin at a 45° angle, capturing images of the diaphragm’s movement during inspiration and expiration. M-mode ultrasound was utilized to calculate diaphragm excursion distance, providing an objective measurement of diaphragm mobility. Aerobic capacity was evaluated using the 20-meter shuttle run test, a well-validated method for estimating maximal oxygen uptake(VO_2max)(Léger et al., 1988; Mayorga-Vega et al., 2015). Participants were instructed to run between two markers placed 20 meters apart, keeping pace with an audio signal that gradually increased in speed. The initial speed was set at 8.5 km/h, with increments of 0.5 km/h per minute. The test continued until the participant failed to reach the marker twice consecutively. The total number of laps completed was recorded as the measure of maximal

aerobic capacity(MAC).

5. Statistical Analysis

All statistical analyses were performed using SPSS version 23.0(IBM Corp., Armonk, NY, USA). The Shapiro-Wilk test was used to assess the normality of the data. As the data were found to be normally distributed, parametric tests were applied. Independent t-tests were conducted to compare differences between groups, and paired t-tests were used to assess pre- and post-intervention differences within each group. A significance level of 0.05 was set for all statistical tests.

III. Results

There were no significant differences in age, height, or weight between the experimental and control groups($p>.05$)(table 1). In the respiratory muscle taping(RMT) group, no significant changes were observed in diaphragm movement distance(DMD), maximal aerobic capacity(MAC), forced vital capacity(FVC), slow vital capacity(SVC), maximal inspiratory pressure(MIP), or maximal expiratory pressure(MEP) after the intervention($p>.05$)(table 2). Similarly, in the control muscle taping(CMT) group, none of these variables showed significant pre-post differences($p>.05$)(table 2). Post-inter-

Table 2. Comparison of pre-post test according to intervention

(n=37)

		Pre	Post	t	p	
RMT (n=19)	DMD(cm)	2.36±0.59	2.47±0.60	0.57	0.57	
	MAC(n)	79.21±36.11	94.78±36.69	1.32	0.20	
	Lung capacity	FVC	5.94±0.86	5.90±0.84	-0.15	0.89
		SVC	5.94±0.86	5.98±0.82	0.15	0.88
		MIP	118.26 ±33.63	128.94±28.88	1.05	0.30
MEP		98.68±36.00	102.68±31.57	0.37	0.72	
CMT (n=18)	DMD(cm)	2.14±0.40	2.22±0.37	0.62	0.54	
	MAC(n)	85.94±27.08	99.83±37.61	1.27	0.21	
	Lung capacity	FVC	5.69±0.49	5.72±0.46	0.19	0.85
		SVC	5.64±0.52	5.62±0.51	-0.12	0.91
		MIP	113.05 ±49.09	126.88±52.19	0.82	0.42
MEP		104.88 ±57.12	108.83±61.74	0.20	0.84	

DMD: diaphragm movement distance, MAC: maximal aerobic capacity, FVC: forced vital capacity, SVC: Slow vital capacity, MIP: maximum inspiratory pressure, MEP: maximum expiratory pressure

Table 3. Comparison of post intervention between group

	RMT (n=19)	CMT (n=18)	<i>t</i>	<i>p</i>
DMD(cm)	2.47±0.60	2.22±0.37	1.53	0.14
MAC(n)	94.78±36.69	99.83±37.61	-0.41	0.68
FVC	5.90±0.84	5.72±0.46	0.81	0.42
<i>Lung</i> SVC	5.98±0.82	5.62±0.51	1.61	0.12
<i>capacity</i> MIP	128.94±28.88	126.88±52.19	0.15	0.88
MEP	102.68±31.57	108.83±61.74	-0.38	0.71

DMD: diaphragm movement distance, MAC: maximal aerobic capacity, FVC: forced vital capacity, SVC: Slow vital capacity, MIP: maximum inspiratory pressure, MEP: maximum expiratory pressure

vention comparisons between the RMT and CMT groups revealed no significant differences in any of the measured variables, including DMD, MAC, FVC, SVC, MIP, and MEP($p>.05$)(table 3).

IV. Discussion

This study examined the immediate effects of kinesio taping applied to the primary and accessory inspiratory muscles on diaphragm movement, lung volumes, respiratory pressures, and maximal aerobic capacity in healthy young males. Contrary to several previous reports suggesting that kinesio taping enhances respiratory function through proprioceptive facilitation and improved muscle recruitment(Kase et al., 2003; Malehorn et al., 2015; Metin Ökmen et al., 2020), our results did not demonstrate significant between-group differences in key outcomes. The absence of superior gains in the kinesio taping group suggests that the intervention did not confer a measurable advantage over control taping in this population.

Although small within-group changes were observed in diaphragm movement distance(DMD) and maximal aerobic capacity(MAC) in both the kinesio taping and control groups, these effects were not significant between groups. In the present study, no significant differences were observed in diaphragm excursion, exercise capacity, or pulmonary function between the experimental and control groups, either before or after the intervention. These findings indicate that the short-term application of kinesio taping to the respiratory and accessory respiratory muscles did not

produce measurable effects. Given the absence of significant changes in diaphragm movement, it is plausible that no corresponding improvements in pulmonary function or exercise performance occurred. This pattern indicates that improvements may be attributable to repeated testing, familiarization with the tasks, or general physical effort rather than the taping itself. The lack of specific benefit is consistent with a recent systematic review and meta-analysis in individuals with COPD, which reported no significant effects of kinesio taping on forced expiratory volume in one second(FEV₁), forced vital capacity(FVC), FEV₁/FVC ratio, or peak expiratory flow(de Campos et al., 2023).

The absence of between-group differences in MIP and MEP also contradicts earlier studies suggesting that kinesio taping enhances inspiratory or expiratory muscle strength via improved proprioceptive feedback and accessory muscle recruitment(Wang et al., 2017; Lee, 2021). In our cohort, static lung volumes(FVC, SVC) and respiratory pressures remained statistically similar between groups following the intervention, challenging claims that short-term kinesio taping can meaningfully alter volumetric capacity or muscle performance in healthy individuals.

Several factors may explain discrepancies with prior positive findings. First, much of the earlier evidence derives from small-scale clinical studies in patients with compromised respiratory function, where even minor facilitation may yield noticeable changes(Arslan et al., 2018; Metin Ökmen et al., 2020; Tomruk et al., 2020; Zeng et al., 2021). In contrast, healthy young adults may already operate near their physiological ceiling, limiting the scope for additional improvement(Oguz et al., 2021). Second, methodological heterogeneity in taping techniques, outcome measures, and testing protocols across studies complicates direct comparison(Temel Aksu et al., 2023; Wang et al., 2017). Finally, many positive reports have focused on immediate within-group improvements without rigorous between-group controls, which may overestimate the true effect of kinesio taping(Lee, 2021; Malehorn et al., 2015).

The current findings align with a growing body of literature suggesting that kinesio taping may not provide clinically meaningful short-term enhancements in pulmonary function or aerobic performance in healthy individuals. Future research should adopt longer intervention periods, include diverse populations with varying baseline respira-

tory capacities, and compare respiratory-specific taping to sham or placebo conditions under strictly controlled environments. Until such evidence emerges, the routine use of kinesio taping for immediate respiratory performance enhancement in healthy adults should be approached with caution.

V. Conclusion

In conclusion, the current evidence suggests that kinesio taping does not produce immediate, clinically significant improvements in respiratory muscle function or aerobic capacity in healthy young adults. While kinesio taping may hold therapeutic potential in populations with impaired respiratory function, its application for enhancing pulmonary performance in healthy individuals warrants cautious consideration. Future investigations employing robust, placebo-controlled methodologies and longer intervention durations across diverse populations are essential to delineate the true scope and mechanisms of kinesio taping's effects.

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