

RESEARCH ARTICLE

Symptom Severity and Hand Function Following Kinesio Taping Application in Informal Workers with Carpal Tunnel Syndrome

Keparahan Gejala dan Fungsi Tangan Setelah Pemberian Kinesio Taping pada Pekerja Informal dengan Sindrom Terowongan Karpal

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Abstract

Carpal Tunnel Syndrome (CTS) is a common musculoskeletal disorder caused by compression of the median nerve, resulting in paresthesia, pain, and impaired hand function. If left untreated, CTS may lead to hand weakness, limitations in daily activities, reduced work productivity, and poorer quality of life. Although Kinesio Taping has emerged as a non-invasive intervention, evidence of its effectiveness among informal workers remains limited. This study aimed to analyze changes in symptom severity and hand function before and after kinesio taping application in informal workers with Carpal Tunnel Syndrome. A quasi-experimental pretest–posttest study without a control group was conducted among 40 informal workers aged 18–60 years who had been clinically diagnosed with Carpal Tunnel Syndrome in Surakarta, Indonesia. The participants received Kinesio Taping for 4 weeks. Outcomes were assessed using the Boston Carpal Tunnel Questionnaire (BCTQ), which included the Symptom Severity Scale (SSS) and Functional Status Scale (FSS). As the data were not normally distributed based on the Shapiro–Wilk test, pre- and post-intervention scores were compared using the Wilcoxon signed-rank test. The median SSS score decreased significantly from 3.55 to 2.10, while the median FSS score decreased from 3.30 to 2.00 ($p < 0.001$). These findings indicate a reduction in symptom severity and an improvement in hand function following kinesio taping application. The study supports its use as a practical, low-cost, and accessible intervention for informal workers with limited access to healthcare services.

Keywords: carpal tunnel syndrome, hand function, informal workers, kinesio taping

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Abstrak

Carpal Tunnel Syndrome (CTS) adalah kondisi muskuloskeletal umum, ditandai dengan kompresi saraf median yang menyebabkan paraestesia, timbulnya nyeri, dan penurunan fungsi tangan. Apabila tidak ditangani secara tepat, kondisi ini dapat mengakibatkan kelemahan tangan, keterbatasan aktivitas sehari-hari, penurunan produktivitas kerja, serta penurunan kualitas hidup. Kinesio Taping semakin sering diterapkan sebagai intervensi non-invasif. Namun, bukti ilmiah mengenai efektivitasnya pada pekerja sektor tidak formal masih terbatas. Penelitian ini bertujuan untuk menganalisis perubahan tingkat keparahan gejala dan fungsi tangan sebelum dan sesudah pemberian kinesio taping pada pekerja sektor informal dengan Carpal Tunnel Syndrome. Penelitian ini menggunakan desain kuasi eksperimental pretest–posttest tanpa kelompok kontrol yang melibatkan 40 pekerja sektor tidak formal berusia 18-60 tahun dengan CTS di Surakarta. Intervensi Kinesio Taping diberikan selama 4 minggu. Hasil diukur menggunakan Boston Carpal Tunnel Questionnaire (BCTQ), termasuk Symptom Severity Scale (SSS) dan Functional Status Scale (FSS). Uji normalitas menggunakan Shapiro–Wilk menunjukkan distribusi yang tidak normal sehingga data dianalisis menggunakan Uji Wilcoxon signed-rank. Hasil menunjukkan penurunan yang signifikan pada median SSS dari 3,55 menjadi 2,10 dan median FSS 3,30 menjadi 2,00 dengan $p < 0,001$. Temuan ini menunjukkan adanya penurunan keparahan gejala dan perbaikan fungsi tangan setelah pemberian kinesio taping. Studi ini menyoroti potensi kinesio taping sebagai intervensi yang praktis, berbiaya rendah, dan mudah diakses bagi pekerja informal dengan akses terbatas terhadap layanan kesehatan.

Kata Kunci: carpal tunnel syndrom, fungsi tangan, pekerja informal, kinesio taping

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Highlight:

- Kinesio taping was associated with significant reductions in symptom severity among informal workers with Carpal Tunnel Syndrome.
- Hand function significantly improved following kinesio taping, as indicated by reduced Functional Status Scale scores.
- The findings provide preliminary evidence supporting kinesio taping as a potential intervention for symptom and functional improvement in Carpal Tunnel Syndrome.

INTRODUCTION

Carpal Tunnel Syndrome (CTS) is one of the most common peripheral neuropathies caused by compression of the median nerve within the carpal tunnel. The condition is characterized by symptoms such as numbness, pain, paresthesia, and hand weakness, which may interfere with daily functional activities and negatively affect quality of life. CTS is widely recognized as the most common entrapment neuropathy, with characteristic clinical manifestations affecting the upper extremities (Sevy et al., 2023). The incidence of Carpal Tunnel Syndrome (CTS) may increase due to various risk factors, including occupational and individual factors. Occupational activities involving repetitive movements, excessive force exertion, and non-ergonomic wrist

postures may constitute major contributing factors. In addition, individual characteristics, such as sex, age, and overall health status, may also play important roles in increasing susceptibility to this disorder (Abbas et al., 2024).

Globally, Carpal Tunnel Syndrome (CTS) has a relatively high prevalence and is considered one of the most frequently reported musculoskeletal disorders. A recent meta-analysis reported that the prevalence of CTS may reach approximately 14.4% in the general population, with higher rates observed among individuals engaged in repetitive manual work (Gebrye et al., 2024). Moreover, the prevalence of Carpal Tunnel Syndrome (CTS) among workers is also relatively high. Epidemiological studies have reported an incidence of approximately 7.8% among workers, particularly those engaged in occupations involving repetitive hand movements and high physical demands (Dale et al., 2013). Among specific occupational groups, such as dental healthcare professionals, the prevalence of CTS may exceed 15%, potentially due to prolonged exposure to repetitive occupational tasks (Chenna et al., 2023).

Previous studies have shown that occupations involving repetitive hand movements, high grip forces, or a combination of both significantly increase the risk of Carpal Tunnel Syndrome (CTS) (Hassan et al., 2022). This finding is supported by reports of a high incidence of CTS among manufacturing workers, assembly-line workers, construction workers, agricultural workers, and healthcare professionals, who are frequently exposed to repetitive manual activities and suboptimal ergonomic conditions. Biomechanical exposures, including repetitive movements, high grip forces, and non-ergonomic wrist postures, are considered major determinants of CTS among working populations. Nevertheless, evidence regarding CTS among informal-sector workers, who generally experience high ergonomic exposure and have limited access to healthcare services, remains relatively scarce (Karjalainen et al., 2022; Rotaru-Zavaleanu et al., 2024).

Management of Carpal Tunnel Syndrome (CTS) is generally based on conservative approaches, particularly for mild-to-moderate cases, including wrist splinting, nerve-gliding exercises, and physiotherapy interventions. One emerging non-invasive treatment modality is kinesio taping, which involves the application of elastic therapeutic tape to support soft tissues without restricting movement, thereby potentially reducing pain and improving functional performance. Several studies have demonstrated the potential of kinesio taping to improve clinical outcomes in individuals with CTS. Randomized controlled trials have shown that kinesio taping can significantly reduce pain and improve hand function compared with baseline conditions (Chen et al., 2024). Furthermore, another study reported that six weeks of kinesio taping resulted in greater improvements in pain, hand function, and grip strength than conventional therapy in patients with CTS (Hong et al., 2026).

However, evidence regarding the effectiveness of kinesio taping for *Carpal Tunnel Syndrome* (CTS) remains inconsistent. Variations in study design, population characteristics, intervention duration, and outcome measures have contributed to the lack of consensus regarding the efficacy of this intervention (Inceboy et al., 2025). Most previous studies have been conducted among patients recruited from hospitals or healthcare facilities, whereas research involving informal-sector workers, who are exposed to repetitive manual activities and have limited access to healthcare services, remains scarce. In addition, quasi-experimental studies investigating the effectiveness of kinesio taping in this population are limited. Therefore, this study aimed to analyze changes in symptom severity and hand function before and after kinesio taping application among informal workers with Carpal Tunnel Syndrome.

METHODS

This study was conducted in August 2025 using a quasi-experimental design with a single-group pretest–posttest design without a control group. The sample was selected using consecutive sampling, in which all subjects who met the inclusion criteria and did not meet the exclusion criteria during the study period were recruited until the required sample size was reached. During the study period, 40 eligible participants were recruited. The study participants were informal-sector workers in the Surakarta area who engaged in repetitive manual activities and were therefore at risk of developing *Carpal Tunnel Syndrome* (CTS). CTS was diagnosed through clinical examination using the *Phalen test*, *Tinel test*, and *Flick sign*. Symptom severity and hand function were assessed using the *Boston Carpal Tunnel Questionnaire* (BCTQ), which comprises the *Symptom Severity Scale* (SSS) and *Functional Status Scale* (FSS).

The inclusion criteria were informal-sector workers aged 18–60 years who had been employed in the informal sector for at least 1 year, exhibited CTS symptoms confirmed through clinical examination, and were willing to participate in all study procedures by providing written informed consent after receiving a detailed explanation of the study. The exclusion criteria included a history of wrist surgery or fracture, other neurological disorders affecting hand function, and severe systemic diseases that could interfere with the assessment of *Carpal Tunnel Syndrome*.

Following the screening and selection process, all eligible participants received kinesio taping applied to the wrist area. Outcomes were assessed before the intervention (pretest) and after the intervention (posttest) using the BCTQ, comprising the *Symptom Severity Scale* (SSS) and *Functional Status Scale* (FSS).

All participants received kinesio taping applied to the wrist area by a trained physiotherapist. Before application, the skin was cleansed, and the wrist was positioned in slight extension. Kinesio taping was applied using a decompression technique over the *carpal tunnel* with moderate tension (15–50%) (Cheatham et al., 2021). The tape was maintained for 3–5 days before being replaced with a new application. The intervention was administered over a 4-week period. Outcomes were assessed at two time points: before the intervention and after completion of the entire intervention period, using the BCTQ (Chen et al., 2024).

Data analysis was performed using statistical software. Normality was first assessed using the Shapiro–Wilk test to determine the distribution of the data. If the data were not normally distributed, the Wilcoxon signed-rank test was used to compare the pretest and posttest scores. Statistical significance was set at $p < 0.05$.

The study received ethical approval from the Health Research Ethics Committee of the Faculty of Health Sciences (approval number: 1415/KEPK-FIK/VII/2025). All participants provided written informed consent after receiving adequate information about the study before participation.

RESULTS AND DISCUSSION

Subject characteristics

Based on Table 1, most subjects were in the <25-year and 25–35-year age groups, with 18 subjects (45%) in each group, while only 4 subjects (10%) were aged >35 years. The predominance of younger subjects may be related to the characteristics of the informal occupations in the study setting, which are generally undertaken by individuals of productive age. Regarding sex, the majority of subjects were male, with 34 subjects

(85%), while 6 subjects (15%) were female.

Table 1. Analysis of subject characteristics

Variable		n	%
Age	<25 years	18	45
	25–35 years	18	45
	>35 years	4	10
Sex	Female	6	15
	Male	34	85

Source : Primary data, 2025

Based on Table 2, the data were considered normally distributed when the p -value was > 0.05 . For the SSS component, the pretest data had a p -value of 0.153, indicating a normal distribution, whereas the posttest data had a p -value of 0.002, indicating a non-normal distribution. For the FSS component, the pretest data had a p -value of < 0.001 , indicating a non-normal distribution, whereas the posttest data had a p -value of 0.154, indicating a normal distribution. Therefore, differences between pretest and posttest scores were analyzed using the Wilcoxon signed-rank test.

Table 2. BCTQ normality test

BCTQ		p -value
SSS	Pretest	0.153
	Posttest	0.002*
FSS	Pretest	< 0.001 *
	Posttest	0.154

Note: SSS, Symptom Severity Scale; FSS, Functional Status Scale. Normality was assessed using the Shapiro–Wilk test, with $p > 0.05$ indicating a normal distribution.

Differences in BCTQ scores before and after the intervention

Based on the analysis, the Symptom Severity Scale (SSS) score decreased substantially following the intervention, from a median of 3.55 (IQR: 3.40–3.70) to 2.10 (IQR: 2.00–2.30). Similarly, the Functional Status Scale (FSS) score decreased from a median of 3.30 (IQR: 3.13–3.50) to 2.00 (IQR: 2.00–2.20). The Wilcoxon signed-rank test demonstrated statistically significant differences between pre- and post-intervention scores for both SSS and FSS ($p < 0.001$). Table 3 shows that the decrease in SSS scores indicates an improvement in symptom severity, whereas the decrease in FSS scores indicates an improvement in hand function following kinesio taping intervention. These findings suggest that kinesio taping may reduce symptom severity and improve hand function in patients with *Carpal Tunnel Syndrome*.

Table 3. Differences in BCTQ scores before and after the intervention

Variable	Median (IQR) Pre	Median (IQR) Post	p -value
SSS	3.55 (3.40-3.70)	2.10 (2.00-2.30)	< 0.001
FSS	3.30 (3.13-3.50)	2.00 (2.00-2.30)	< 0.001

Note: Data are presented as median (interquartile range [IQR]). Comparisons between pre- and post-intervention scores were performed using the Wilcoxon signed-rank test. SSS, Symptom Severity Scale; FSS, Functional Status Scale; BCTQ, Boston Carpal Tunnel Questionnaire.

Sex Distribution and Occupational Characteristics

The characteristics of the participants showed that the majority were male (85%), which differs from previous epidemiological studies reporting a higher prevalence of *Carpal Tunnel Syndrome* (CTS) among females (Padua et al., 2023). This discrepancy may be attributable to differences in the study population and occupational characteristics. In the present study, participants were informal-sector workers engaged in various occupations, and the observed sex distribution may therefore reflect the characteristics of the source population rather than the sex distribution of CTS in the general population. The use of consecutive sampling also allowed all eligible workers who met the inclusion criteria during the study period to be recruited without predetermined sex-based quotas. In addition, informal-sector occupations frequently involve repetitive hand movements, forceful gripping, non-neutral wrist postures, and prolonged use of hand-held tools, which may contribute to median nerve compression and increase the risk of CTS. These occupational biomechanical exposures have been associated with CTS among working populations regardless of sex (Amin and Oginawati, 2023; Padua et al., 2023). Therefore, the predominance of male participants in this study should be interpreted in the context of the occupational characteristics of the recruited population rather than as evidence of a sex-specific pattern of CTS prevalence.

Changes in symptom severity scale (SSS) after kinesio taping

This study showed changes in symptom severity and hand function following kinesio taping application among informal workers with Carpal Tunnel Syndrome (CTS), as indicated by reductions in the Symptom Severity Scale (SSS) and Functional Status Scale (FSS) scores after the intervention. These findings are consistent with previous studies (Chen et al., 2024), reporting significant improvements in symptoms and hand function among patients with CTS following kinesio taping. From a physiological perspective, the effects of kinesio taping may extend beyond the reduction of mechanical pressure and involve multiple interacting mechanisms, including effects on the skin and subcutaneous tissues that may contribute to local tissue changes (Güvener et al., 2024).

Changes in symptom severity scale (sss) scores following kinesio taping

The results showed a statistically significant difference in the Symptom Severity Scale (SSS) scores before and after kinesio taping application ($p < 0.001$). This reduction indicates an improvement in the primary symptoms of CTS, including pain, paresthesia, and numbness associated with median nerve compression. These findings are consistent with a systematic review and meta-analysis reporting that kinesio taping was associated with significant improvements in pain and symptoms among patients with CTS, particularly in the short term (Tomás-Escolar et al., 2023). Other studies have also reported greater improvements in symptoms among patients with mild-to-moderate CTS following kinesio taping. The consistency of these findings suggests that kinesio taping may provide a beneficial conservative treatment option, particularly for patients without advanced median nerve damage (Li et al., 2025). From a physiological perspective, the reduction in symptoms may be attributable to several interacting mechanisms. The lifting effect of the tape may increase interstitial space and thereby reduce mechanical pressure on the median nerve. In addition, increased local microcirculation and lymphatic drainage may help reduce tissue edema and subsequently decrease intracarpal pressure. Cutaneous stimulation of mechanoreceptors

may also modulate nociceptive transmission through the gate control mechanism (de Sire et al., 2022; Tan et al., 2022). Collectively, these mechanisms may contribute to the reduction in symptom severity observed following kinesio taping.

Changes in functional status scale (FSS) scores following kinesio taping

In this study, there was a statistically significant difference in Functional Status Scale (FSS) scores before and after kinesio taping application ($p < 0.001$). The decrease in FSS scores indicates an improvement in hand function following the intervention, as reflected in the ability to perform daily activities such as grasping, writing, carrying objects, and other manual activities. These findings are consistent with previous studies demonstrating that kinesio taping can improve hand function and grip strength in patients with *Carpal Tunnel Syndrome* (CTS) (Li et al., 2025). Similar findings have also been reported in studies indicating that kinesio taping, particularly when combined with other physiotherapy interventions, may improve hand function and reduce disability in patients with CTS (Eraslan dan Baltaci, 2023).

The consistency of these findings may be partly explained by the use of kinesio taping as a conservative intervention for patients with mild-to-moderate CTS. Reductions in symptom severity may allow patients to use their hands more effectively during functional activities. In addition, the sensory stimulation produced by kinesio taping may enhance proprioceptive input and neuromuscular control, thereby facilitating more coordinated hand movements (Mo et al., 2024). The improvement in hand function observed in this study may therefore reflect the combined effects of symptom reduction and improved sensorimotor control following kinesio taping. The relationship between reduced *Symptom Severity Scale* (SSS) scores and improved hand function is also clinically relevant, as alleviation of CTS symptoms may reduce functional limitations and enable patients to use their hands more effectively in daily activities (Tomás-Escolar et al., 2023).

This study has several limitations that should be considered when interpreting the findings. First, the quasi-experimental design without a control group limits the ability to establish a causal relationship between the intervention and the observed outcomes. Second, the relatively small sample size and recruitment of participants exclusively from Surakarta may limit the generalizability of the findings to broader populations. In addition, the sample was predominantly male (85%) and aged <35 years (90%), with participants representing diverse informal occupations. The outcomes were assessed over a short-term follow-up period; therefore, the durability of the effects of kinesiotaping remains uncertain. These sample and methodological characteristics may limit the applicability of the findings to informal workers with Carpal Tunnel Syndrome who have different demographic and occupational characteristics. Future studies should employ randomized controlled trial designs with appropriate control groups, larger and more diverse samples, and longer follow-up periods to provide more robust evidence regarding the effectiveness and long-term effects of kinesiotaping in patients with Carpal Tunnel Syndrome.

CONCLUSIONS

Based on the findings of this study, there were differences in symptom severity and hand function scores before and after kinesio taping application among informal workers with Carpal Tunnel Syndrome. The Symptom Severity Scale (SSS) and

Functional Status Scale (FSS) scores decreased after the intervention, indicating improvements in symptoms and hand function. As a preliminary study using a quasi-experimental design without a control group, the observed changes cannot be interpreted as evidence that kinesio taping directly caused these improvements. Further studies using a randomized controlled trial (RCT) design, a larger sample size, a control group, and a longer follow-up period are needed to confirm these findings.

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