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# The Effect of Kinesiological Taping Applied to the Tibialis Anterior Muscle on Gait Parameter in Stroke Patients**

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**ABSTRACT:**
**Purpose:** The aim of this study is to examine the immediate effect of kinesiological taping on the tibialis anterior muscle with muscle stimulation technique on gait parameters in individuals with stroke.
**Material and Methods:** The study included 28 stroke patients with a mean age of 53.57±12.38 years. Gait analysis was performed on the participants at different times with kinesiological taping and sham (plaster-rigid) taping and without any intervention. Kinesiological taping was applied to the tibialis anterior muscle using a muscle technique. Sham taping was applied along the tibialis anterior muscle from the origin to the insertion, with the ankle in a neutral position, without applying any tension to the muscle, skin or tape. The gait parameters of the participants were evaluated with the BTS G-Walk Analysis System.
**Results:** According to the data obtained as a result of evaluations, it was concluded that the immediate effect of the kinesiological taping applied on the tibialis anterior muscle to the gait parameters was not statistically significant (p> 0.05). In addition, it was concluded that the kinesiological and sham taping applied to the tibialis anterior muscle is not superior to each other (p> 0.05).
**Conclusion:** Kinesiological taping of the tibialis anterior muscle is not sufficient to improve gait functions in stroke patients.
***Keywords:*** *Stroke; Kinesiotape; Gait Analysis*

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## INTRODUCTION

Stroke is a focal (sometimes global) disorder of cerebral function that lasts more than 24 hours or results in death, according to the definition of the World Health Organization (WHO) (Hatano, 1976). Stroke ranks second among the causes of deaths in the world with 11,8%. (Feigin et al., 2013). Approximately one-third of patients with stroke lose their lives within an average of one year, while approximately one-third of those who continue their lives remain dependent on daily life activities for the rest of their lives (Utku, 2007). After the stroke, disorders such as motor control loss, muscle weakness, abnormal movement patterns, spasticity, joint limitations, and sensory dysfunctions, inability to transfer weight to the affected limb, and changes in the gait pattern and balance skills occur (Esquenazi et al., 2009). Changes in gait ability after stroke are related to the severity of the sensorimotor disorder. Half of all acute stroke patients cannot walk, 12% need help during walking, and only 37% can walk independently (Woolley, 2001). The first goal of post-stroke rehabilitation is to regain walking (Goldie et al., 1996). In order to achieve these goals, rehabilitation programs should be prepared by evaluating the person as medical, functional and

psychological. In recent years, various methods have been developed or tried to activate and support the rehabilitation process. One of these methods is the kinesiological taping, which was previously used in musculoskeletal diseases, orthopedic rehabilitation, and athlete's health, but has started to be used in many areas of physiotherapy today. Kinesiological taping is an advantageous application since it is a relatively low cost, easily applicable to patients, non-invasive methods, and has no serious side effects. Therefore, it can be combined safely and comfortably with different treatments (Williams et al., 2012; Halseth et al., 2004). In the literature, studies are examining the effect of kinesiological taping on gait in the lower extremity (Michalak et al., 2009; Kim et al., 2015; Boeskov et al., 2014; Choi et al., 2013), but there is no study on the immediate effect of kinesiological taping applied on the tibialis anterior muscle with muscle stimulation technique. Studies showing the acute effect of kinesiological taping are not clear in the literature. In addition, it is not clear whether the changes in the functional level of the patient are due to the long-term effects of kinesiological taping or the treatment applied in addition to the taping (Qafarizadeh et al., 2018; Koca et al., 2018)**.** Therefore, in our study, it was aimed to examine the effect of kinesiological taping without additional treatment. The aim of this study is to examine the immediate effect of kinesiological taping on the tibialis anterior muscle with muscle stimulation technique on gait parameters in individuals with stroke.

## MATERIAL and METHODS

This study was carried out in line with the principles of the Helsinki Declaration between June 2018-May 2019 and the study protocol was approved by relevant institution Ethical Committee for Non-Interventional Clinical Research. (No:60116787-020/41771). This study is registered with ClinicalTrials.gov, Clinical Trial Number: NCT04425811 and was designed as a double-blind study. Twenty-eight stroke individuals with a mean age of 53.57±12.38 years, aged 25-70, who were treated in adult Neurological Rehabilitation Unit, volunteered and had written informed consent were included in the study. Individuals who had a stroke (hemiplegic/hemiparetic) for the first time, had a lesion in a single hemisphere, and had a history of stroke of 1 year were included in the study. Patients with neurological or orthopedic comorbid disease, plantar flexor muscles spasticity greater than 2 according to the Modified Ashworth Scale, and those with communication problems were excluded from the study.

### Measurements

The demographic and clinical information of the participants were recorded on a pre-formed form. The dominant side lower limb of the participants was determined as the first preferred lower limb to take steps when starting walking. Then, three evaluation tests were applied to examine the suitability of the participants for the inclusion criteria. Firstly, to determine the cognitive level of the participants, Hodkinson Mental Test (HMT) was recorded and the test score of 7 and above were included in the study. Afterward, the ambulation level of the participants were determined with the Functional Ambulation Classification (FAC), and those with 3 or more scores were included in the study. Finally, the Modified Ashworth Scale (MAS) was used to determine the muscle tone of the person, and those with a score of 2 or less were evaluated by evaluating the plantar flexor muscles spasticity. Turkish validity and reliability of HMT, FAC and MAS have been established (Dirik et al., 2006; Akdeniz et al., 2015; Mehrholz et al., 2005). Gait parameters of the participants included in the study were evaluated with the BTS G-Walk Spatio-Temporal Gait Analysis System.

### Research Data Registration Form

Age, weight, height, body mass index (BMI), educational status, occupation, and gender were recorded as demographic data of the casesFor clinical data, clinical diagnosis, affected hemisphere (dominant/non-dominant), dominant side, hemiparesis/hemiplegia duration, and assistive device (orthosis, walking aid, etc.) were recorded. Before the measurements, the participants were informed about the evaluations and the taping application.

**Evaluation of Gait Parameters (BTS G-Walk Spatio-Temporal Gait Analysis System)**

BTS G-Walk Spatio-Temporal Gait Analysis System was used to evaluate gait parameters. Before and after the taping applications of the patients, gait parameters were measured by asking them to walk with a shoe that they always use daily with a "walk normally" command on a pre-marked and determined 10-meter track and stop with a "stop" command after 10 meters. The analysis port of the BTS G-Walk device is attached to the patient's L4-L5 or L5-S1 vertebra level with a waist belt and secured. By measuring the gait parameters and kinematic analysis of the pelvis through the analysis port, the measurement results are transferred to the computer as numerical and graphical data via the USB connection chip and BlueTooth. The device allows the kinematic analysis of the pelvis to be performed in 3 planes while comparing the right and left extremities with normal values. In addition to the functional analysis of gait disorders secondary to soft tissue injury, amputation, and neurological diseases, it provides objective information to the patient and physiotherapist when used during gait training with different grounds and tools. Gait parameters such as cadence, speed, stride length, stride width, gait cycle duration, stance, and swing phase duration can be calculated (Wren et al., 2011; Trojaniello et al., 2014).

**Evaluation Protocol**

After the research data record form, HMT, FAC and MAS evaluations applied to the participants, gait parameters of the participants included in the study were measured in three stages:

*The First Stage:* The cases were asked to walk with the command 'walk 10 meters normally' without any intervention, while the gait parameters were measured with the BTS G-WALK Tempora-Spatial wireless digital gait analysis system (Figure 1).


**Figure 1:** BTS G-WALK Tempora-Spatial wireless digital gait analysis system

*The Second Stage:* Following the first stage, the patients were rested for 2 hours without any physical activity, and after the kinesiological taping, gait parameters were measured again.

*The Third Stage:* In order to exclude the learning effect, gait parameters were re-evaluated by performing sham (plaster-rigid) taping on the 7th day (1 week later) at the third stage.

Kinesiological and sham taping is performed by a physiotherapist certified to practice kinesiotape. Measurement of gait parameters and taping applications were carried out by different

physiotherapists and no information was given about the type of taping applied both to the physiotherapist who measured the gait parameters and to the participants. For sham taping application, skin-colored medical sticking plaster tape was used. No additional treatment was applied to the taping applied to the participants while evaluating the gait parameters. Gait parameters were evaluated with the immediate effect of taping. During the measurement of the gait parameters, each patient was asked to use their daily shoes. The cost of the kinesiological and sticking plaster tape used in the study was covered by the researcher.

**Application of Kinesiological and Sham Taping**

In our study, kinesiological taping for the tibialis anterior muscle was applied using muscle technique (stimulation). The taping was performed with the participants lying on a stretcher in the supine position. The kinesiological tape was cut in the shape of I considering the participant's muscle length, and the edges were ovalized, the skin was cleaned of moisture, hair and oil. While applying the muscle technique (stimulation), the tibialis anterior muscle was stretched in the plantar flexion and eversion position, and it was applied from the origo to the insertion with a 25-50% tension. It was then activated by applying heat along the tape (Çeliker et al., 2011) (Figure 2).

Sham taping with a plaster-rigid tape was applied along the tibialis anterior muscle from the origin to the insertion, without applying any tension to the muscle, skin or band, with the ankle in the neutral position (Figure 3).

**Figure 2:** Kinesiological taping on the tibialis anterior muscle with muscle (stimulation) technique

**Figure 3:** Sham taping application

**Statistical Analysis**

As a result of the power analysis, considering that the effect size that can be obtained from the study may be at a medium level (dz = 0,5), it was calculated that at least 27 participants should be included in the study in order to obtain 80% power at 95% confidence level. The data were analyzed with IBM SPSS 21.0 software package. Continuous variables were given as mean ± standard deviation, median and categorical variables as numbers and percentages. The normal distribution of the data was analyzed using the "Shapiro-Wilk Test". Repeated one-way analysis of variance (ANOVA) was used for group analysis, and post-hoc Tukey test was used to evaluate the differences between groups. In all analyzes, p≤0,05 was considered statistically significant.

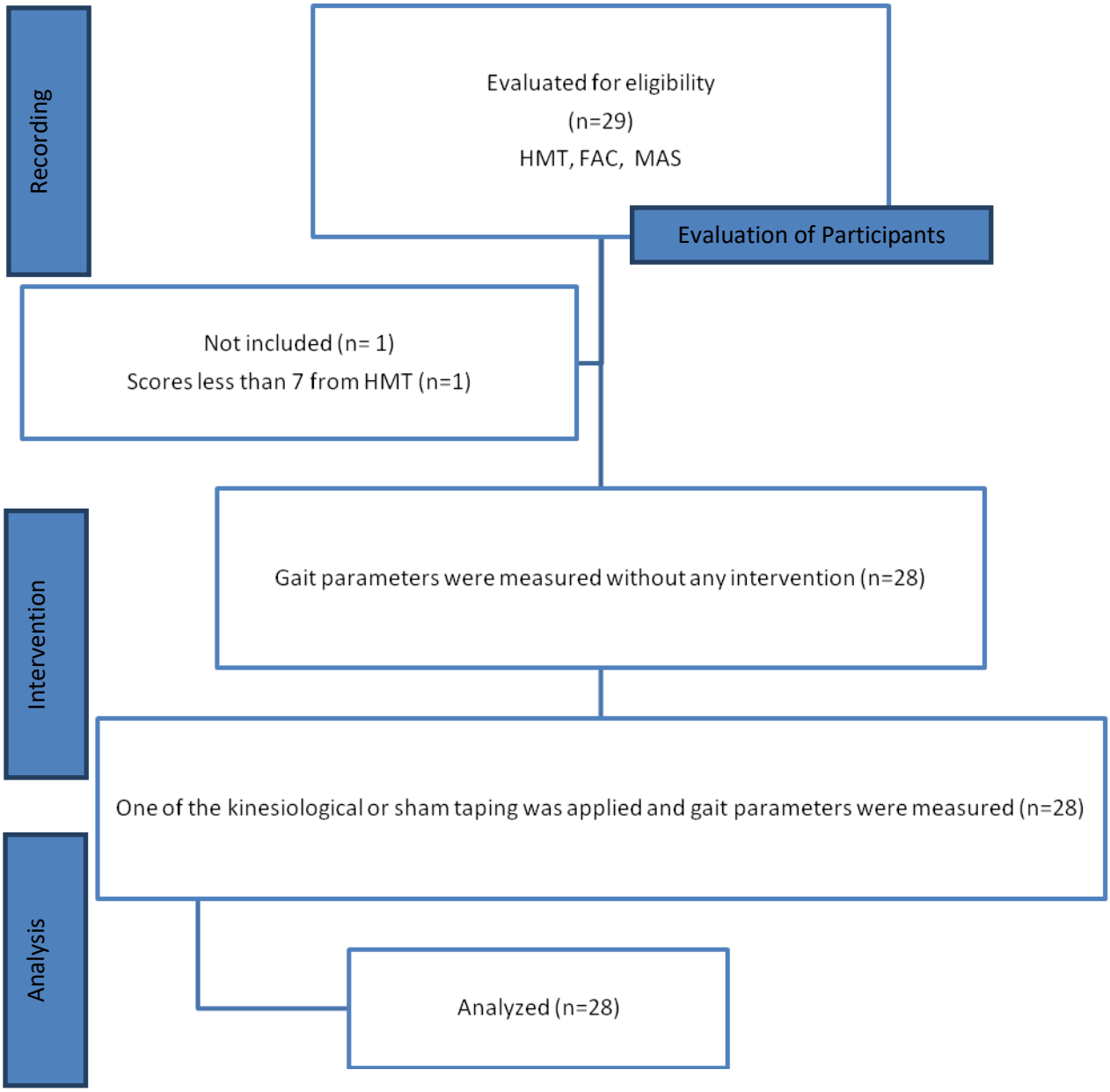


**Figure 4:** Flow diagram of the study

**RESULTS**

The flow diagram of our study is as shown in Figure 4. A total of 29 stroke individuals were included in our study. One of the cases was excluded from the study because she could not get enough points from HMT and continued to work with 28 stroke individuals. Five of the evaluated stroke individuals were female (17,9%) and 23 were male (82,1%).

While the right lower limb was dominant in 25 stroke patients, the lower left limb was dominant in 3. While the right hemisphere of 15 of the stroke individuals were affected, the left hemisphere of 13 were affected. While the etiology of stroke in 26 of the participants was Cerebrovascular Incident (CVI), 1 was intracranial mass and 1 was head trauma. The average age of stroke individuals was 53,5±12,3 years. The average of body mass index (BMI) was 27,5±4,8 kg/m$^2$. Mean stroke durations were 7,75±3,7 months. The average score they received from HMT was 9±1,05, and the average score they received from FAC was 4,3±0,6. According to MAS, the mean degree of spasticity of the plantar flexor muscles was 1,1±0,7 (Table 1).

Gait parameters of individuals with stroke; when the cadence, speed, gait cycle duration, double stride length, stride length, stance and swing phase percentages, double support phase percentage and gait symmetry index values were compared between without tape, kinesiological tape and sham tape, there was no statistically significant difference between the measurements (p>0,05) (Table 2).

**Table 1.** Demographic information and test results of individuals with stroke

| Variables | Individuals with Stroke (n=28) | |
|---|---|---|
| | X±SD | Median |
| Age (years) | 53.57±12.3 | 50.00 |
| BMI (kg/m$^2$) | 27.55±4.8 | 27.10 |
| Stroke Duration (month) | 7.75±3.7 | 8.50 |
| HMT | 9.00±1.05 | 9.00 |
| FAC | 4.32±0.6 | 4.00 |
| MAS | 1.10±0.7 | 1.00 |

HMT:Hodkinson Mental Test, FAC: Functional Ambulation Classification, MAS: Modified Ashworth Scale, BMI: Body Mass Index, X: Mean, SD: Standard Deviation.

**Table 2.** Comparison of gait parameters according to measurements with or without tape

| Variables (BTS G-Walk) | Individuals with Stroke (n=28) | | | F | p* |
|---|---|---|---|---|---|
| | X±SD | | | | |
| | Without Tape | Kinesiological Tape | Sham Tape | | |
| Analysis Duration (s) | 24.38±7.4 | 23.63±6.6 | 22.84±7.01 | 0.335 | 0.716 |
| Cadence (steps/min) | 99.67±9.5 | 98.66±7.9 | 96.79±11.9 | 0.603 | 0.549 |
| Gait Speed (m/s) | 0.76±0.2 | 0.79±0.2 | 0.80±0.2 | 0.191 | 0.826 |
| Left Gait Cycle Duration (s) | 1.25±0.1 | 1.25±0.1 | 1.29±0.2 | 0.437 | 0.647 |
| Right Gait Cycle Duration (s) | 1.25±0.1 | 1.25±0.1 | 1.29±0.2 | 0.490 | 0.614 |
| Left Stride Length (m) | 0.96±0.2 | 0.98±0.2 | 1.01±0.2 | 0.222 | 0.801 |
| Right Stride Length (m) | 0.97±0.3 | 0.98±0.2 | 1.01±0.2 | 0.175 | 0.840 |
| Left Stride Length % | 57.14±16.6 | 58.17±14.7 | 59.98±13.2 | 0.260 | 0.772 |
| Right Stride Length % | 57.57±17.3 | 58.06±14.6 | 59.96±13.08 | 0.195 | 0.824 |
| Left Step Length % | 48.68±5.1 | 49.32±4.2 | 49.43±4.6 | 0.210 | 0.811 |
| Right Step Length % | 51.31±5.1 | 50.67±4.2 | 50.56±4.6 | 0.210 | 0.811 |
| Left Stance Phase % | 62.36±5.7 | 61.61±5.7 | 60.95±5.2 | 0.446 | 0.642 |
| Right Stance Phase % | 59.81±5.2 | 60.01±4.2 | 59.76±4.3 | 0.023 | 0.977 |
| Left Swing Phase % | 37.63±5.7 | 38.38±5.7 | 39.04±5.2 | 0.446 | 0.642 |
| Right Swing Phase % | 40.18±5.2 | 39.98±4.2 | 40.23±4.3 | 0.023 | 0.977 |
| Left First Double Support Phase % | 10.93±3.09 | 10.55±2.7 | 10.38±3.2 | 0.240 | 0.787 |
| Right First Double Support Phase % | 11.34±3.7 | 11.13±3.4 | 10.31±3.2 | 0.673 | 0.513 |
| Left Single Support Phase % | 40.17±5.09 | 39.93±4.2 | 40.16±4.4 | 0.023 | 0.977 |
| Right Single Support Phase % | 37.59±5.8 | 38.37±5.7 | 39.15±5.3 | 0.541 | 0.584 |
| Gait Symmetry Index | 86.58±12.4 | 86.93±12.1 | 86.77±11.6 | 0.006 | 0.994 |

p* One-Way Repeated ANOVA

Gait parameters of individuals with stroke; when the values of cadence, speed, gait cycle duration, double stride length, stride length, stance and swing phase percentages, double support phase percentage and gait symmetry index values were compared between kinesiological and sham tape, there was no

statistically significant difference (p>0,05) (Table 3). In stroke individuals, the application of kinesiological or sham taping to the tibialis anterior muscle is not superior to each other in terms of immediate effect on gait parameters.

**Table 3.** Comparison of gait parameters values of kinesiological and sham taping

| Variables (BTS G-Walk) | Individuals with Stroke (n=28) X±SD | | p* |
|---|---|---|---|
| | Kinesiological Tape | Sham Tape | |
| Analysis Duration (s) | 23.63±6.6 | 22.84±7.01 | 0.906 |
| Cadence (steps/min) | 98.66±7.9 | 96.79±11.9 | 0.763 |
| Gait Speed (m/s) | 0.79±0.2 | 0.80±0.2 | 0.984 |
| Left Gait Cycle Duration (s) | 1.25±0.1 | 1.29±0.2 | 0.664 |
| Right Gait Cycle Duration (s) | 1.25±0.1 | 1.29±0.2 | 0.647 |
| Left Stride Length (m) | 0.98±0.2 | 1.01±0.2 | 0.905 |
| Right Stride Length (m) | 0.98±0.2 | 1.01±0.2 | 0.894 |
| Left Stride Length % | 58.17±14.7 | 59.98±13.2 | 0.892 |
| Right Stride Length % | 58.06±14.6 | 59.96±13.08 | 0.886 |
| Left Step Length % | 49.32±4.2 | 49.43±4.6 | 0.995 |
| Right Step Length % | 50.67±4.2 | 50.56±4.6 | 0.995 |
| Left Stance Phase % | 61.61±5.7 | 60.95±5.2 | 0.899 |
| Right Stance Phase % | 60.01±4.2 | 59.76±4.3 | 0.977 |
| Left Swing Phase % | 38.38±5.7 | 39.04±5.2 | 0.899 |
| Right Swing Phase % | 39.98±4.2 | 40.23±4.3 | 0.977 |
| Left First Double Support Phase % | 10.55±2.7 | 10.38±3.2 | 0.976 |
| Right First Double Support Phase % | 11.13±3.4 | 10.31±3.2 | 0.658 |
| Left Single Support Phase % | 39.93±4.2 | 40.16±4.4 | 0.981 |
| Right Single Support Phase % | 38.37±5.7 | 39.15±5.3 | 0.861 |
| Gait Symmetry Index | 86.93±12.1 | 86.77±11.6 | 0.999 |

p* post-hoc Tukey

## DISCUSSION

According to the results of our study in order to examine the immediate effect of kinesiological taping applied to the tibialis anterior muscle in stroke individuals, we concluded that the immediate effect of kinesiological taping on gait parameters was not statistically significant and we found that kinesiological or sham taping applications did not have superiority to each other. When the literature is examined, studies involving kinesiological tape applications with stroke individuals; It appears to be designed to improve hand functions in the upper extremity, increase muscle activity, reduce shoulder pain and regulate muscle tone, and improve balance in the lower extremity, increase muscle activity and regulate muscle tone (Morris et al., 2013). In the literature, there are studies examining the effect of the kinesiological tape applied on the quadriceps femoris, hamstring and gastrocnemius muscles and around the ankle on spasticity, muscle activity, balance and gait parameters (Michalak et al., 2009; Köseoğlu et al., 2017; Ekiz et al., 2015). Only a limited number of studies have been conducted directly on the stimulation of the tibialis anterior muscle (Kim et al., 2015). Apart from these, it did not contain a single isolated muscle, but also a kinesiological tape study for the ankle joint and many other muscles around it. In the literature, some opinions have been made to explain the role of kinesiological taping in increasing somato-sensory sensation, providing correct proprioceptive input and supporting muscle activity. Garnett et al. suggested the hypothesis that the kinesiological tape acts by increasing interaction between actin and myosin filaments or by increasing muscle activation by skin stimulation (Garnett and Stephens, 1981). Robbins et al. reported that the tape can stabilize the joint or create tension on the skin, thereby increasing proprioception and improving motor functions (Robbins et al., 1995). However, the validity of these views has not been fully proven also these studies have examined healthy muscles rather than spastic muscles. Qafarizadeh et al. conducted a study to examine the immediate and 1-week effect of kinesiological taping

on hand functions and spasticity in stroke individuals and applied the kinesiological tape to the wrist and hand extensor muscles with 50% tension. When the immediate and 1-week effect of the kinesiological tape was evaluated, there was a statistically significant difference in the box and block test and the nine-hole peg test, while there was no statistically significant difference in the flexor muscle spasticity (Qafarizadeh et al., 2018). Koca et al. Investigated the acute period effect of kinesiological taping on hand functions in stroke individuals and applied muscle stimulation technique to the forearm extensor muscle region. As a result of the evaluations, they suggested that the application of kinesiological taping had a positive effect on hand functions and hand grip strength (Koca et al., 2018).

In contrast to these studies (Qafarizadeh et al., 2018; Koca et al., 2018) showing the positive effect of kinesiological taping on upper extremity functions, in our study, kinesiological taping was applied to the lower extremity and it was concluded that it did not affect gait functions positively. Similar to these studies, the immediate effect of kinesiological taping was evaluated by applying muscle stimulation technique. The difference in the results we obtained may be caused by the body weight, which significantly affects the lower extremity, and the inability of the tape to provide sufficient mechanical support. In the studies conducted by Köseoğlu et al. and Kim et al. kinesiological taping was applied around the ankle in combination with the physiotherapy program. As a result, it has been reported that kinesiological taping combined with physiotherapy program is more effective than physiotherapy alone in improving lower extremity functions and gait. In these studies (Köseoğlu et al., 2017; Kim et al., 2012), kinesiological taping applications on the ankle joint and surrounding muscles have been applied to more than one region in order to provide more activation, inhibition and stabilization. It has also been applied for a long time in addition to a physiotherapy program. In our study, the possible immediate functional effect of the kinesiological taping on the tibialis anterior muscle was investigated. These results suggest that short-term kinesiological taping does not have a sufficient functional effect on only one lower extremity muscle and cannot provide sufficient mechanical support to the ankle joint.

Park et al. examined the effect of kinesiological taping on the pressure center of the anterior and posterior leg muscles in their study and stated that the taping application revealed changes in the pressure center (park et al., 2020). No evaluation of pressure changes was made in our study, and it was found that kinesiological taping had no effect on gait parameters. The fact that walking is a dynamic and complex process according to pressure changes suggests that kinesiology taping does not provide sufficient mechanical support during walking.

Szczegielniak et al. Therapeutic kinesiological taping was applied to prevent drop foot during walking in their study to examine the effect of kinesiological taping on walking in patients with acute stroke. The gait of the participants was evaluated before the taping application, 1 hour and 1 day after the taping application with 100 meter walking test. As a result, it was found that taping had a statistically significant effect on walking (Szczegielniak et al., 2012). In this study in the literature, taping was applied to many regions around the ankle. In our study, isolated taping was applied to the tibialis anterior and gait parameters were evaluated using a device that collects objective data such as the BTS G-Walk. In the study conducted by Shin et al. With 15 stroke individuals, gait parameters were evaluated with the GAITRite System by eversion taping on the ankle, placebo taping and without taping. Eversion taping was applied by mechanical correction in ankle dorsiflexion and eversion. According to the measurement results, an improvement was observed in gait parameters with ankle eversion taping applied to patients with chronic stroke (Shin et al., 2019). In our study, unlike this study in the literature, kinesiological taping application was applied not to the ankle joint but to the tibialis anterior muscle by muscle stimulation technique, and its immediate effect on gait parameters was not found to be significant. In addition, kinesiological and sham taping were not superior to each other in immediate effect on gait parameters. Shin et al used kinesiological tape in placebo (sham) taping in their study. In our study, a sticking plaster was used as a placebo (sham) tape. As a result, there is a difference

between these two studies in terms of the taping technique and the tape type used in placebo (sham) control, and it can be thought that these situations are effective in the different results of the studies. In addition, in our study, a 1 week (7 days) time difference was added between gait assessments following the taping practices in order to exclude the learning effect of the participants and to ensure the effect of both tapes used. In the study of Shin et al., There is a 10-minute time difference between the evaluations after both taping. It can be thought that this situation may affect the results of the studies. In most studies in stroke individuals, it was mentioned that combined kinesiological taping with 4-6 week physiotherapy programs may be effective on functional parameters, muscle activity, walking and balance (Köseoğlu et al., 2017; Kim et al., 2012). We planned our study to examine how kinesiological taping can affect function in a pure manner. In these studies, it is not clear whether the positive effect during the rehabilitation program was caused by taping or the rehabilitation process. In our study, we reached the conclusion that the use of kinesiological taping in this way is not effective on function. Possible effects of different taping preferences on functional support in patients with stroke should be examined with strong studies.

Kinesiological taping is popularly used to enhance and support function. However, there is not enough evidence for this. In addition, its use with physical therapy applications makes it difficult to determine its effect. We thought that the effect of kinesiological taping without the use of any treatment method could give more objective data.

## CONCLUSION

There are very few studies in the literature on the effects of kinesiological taping in neurological patients. Studies are also related to upper extremity function. The studies carried out include applications for 4-6 weeks together with the physiotherapy program. In this process, treatment-related improvement or the effect of kinesiological tape is not clear. We believe that kinesiological taping is not sufficient, especially in dysfunctions related to spasticity. Therefore, more studies are needed to determine the effectiveness of the kinesiological tape on gait parameters, especially in stroke individuals.

### Strengths of Study

The fact that it is one of the few studies in the literature that examines the immediate effectiveness of the kinesiological tape in stroke individuals, is the use of the computerized objective method, BTS G-Walk, which provides numerical and graphical data by performing spatial and temporal analysis of gait rather than clinical and questionnaire tests, and planned as a double-blind study. The weaknesses of our study; The patients with stroke included are heterogeneous and it is a single center study.

### Conflict of Interest Statement

The authors declare that they have no conflict of interest.

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