

Effect of kinesiio taping therapy combined with breathing exercises on childbirth duration and labor pain: a randomized controlled trial

Ghada E. El-Refaye^a, Engy M. El Nahas^a, Hassan O. Ghareeb^b

^aDepartment of Physical Therapy for Obstetrics and Gynecology, Faculty of Physical Therapy,
^bDepartment of Obstetrics and Gynecology, Faculty of Medicine, Cairo University, Giza, Egypt

Correspondence to Ghada E. El-Refaye, PhD, Faculty of Physical Therapy, Cairo University 7 Ahmed Elzaiat St. Ben Elsaryat, El Dokki-Giza, Postal Code: 12612, Egypt.
Tel: +201005572715;
e-mail: starmoon2008@yahoo.com

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Background

Labor pain is a common complaint. The method used to reduce maternal discomfort should be efficacious and safe for the mother and the child. Several alternative methods have been reported to reduce childbirth pain.

Objective

This study was conducted to evaluate the effect of kinesiio taping combined with breathing exercises on childbirth duration and labor pain.

Participants and methods

This study was conducted on 40 normal full-term primigravida women during the first stage of labor with regular painful, palpable uterine contraction, and cervical dilatation between 3 and 5 cm. They were randomly assigned into two equal groups, group A and group B. Group A (the study group) consisted of 20 women, and group B (the control group) consisted of 20 women. All participants in both groups A and B performed breathing exercises in addition to conventional medical treatment. However, group A patients received kinesiio taping at the lumbar region and anterior lower abdomen during the first stage of normal labor. Assessment of all participants in both groups A and B was carried out before and after the treatment program using visual analogue scale (VAS), cardiotocography, and by measuring the duration of the first stage of labor using a stopwatch.

Results

There was a nonsignificant difference between group A and group B in pain intensity using VAS in the first stage of labor at the first reading (cervical dilatation: 3–4 cm). However, there was a highly significant difference between group A and group B in the pain intensity using VAS in the first stage of labor at the second reading (cervical dilatation: 7–8 cm), favoring group A. Furthermore, there was a highly significant difference between group A and group B in the duration of the first stage of labor, favoring group A.

Conclusion

These results suggest that kinesiio taping combined with breathing exercise is an effective method in reducing labor pain and shortening the duration of the first stage of labor.

Keywords:

breathing exercise, childbirth duration, kinesiio taping, labor pain, randomized controlled trial

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Introduction

Labor is a physiologic process during which the products of conception (the fetus, membranes, umbilical cord, and placenta) are released outside of the womb. Labor is accompanied with alterations in the biochemical connective tissue characteristics and gradual effacement and dilatation of the uterine cervix as a result of rhythmic uterine contractions of sufficient frequency, loudness, and duration [1].

The onset of labor is characterized by regular, painful uterine contractions leading to progressive cervical effacement and dilatation. Cervical dilatation in the absence of uterine contraction suggests cervical insufficiency, whereas uterine contraction without

cervical change does not meet the definition of labor [2].

During labor, pain is felt at different locations, intensity, and quality for each woman. In addition, experience of pain alters throughout the delivery process. Most women in the beginning level of labor feel pain predominantly in the lower belly, whereas others experience severe low back pain. In ~30% of the cases, the pain is continuous and annoying [3].

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Over 90% of women have severe/unbearable labor pain, although recollection fades with time. Typically, the pain is similar to other cases of visceral pain – that is, intermittent, severe, and colicky; it starts in the lower belly and back, spreading to the perineum and thighs. Pain may be influenced by social, societal, and cultural aspects. Certain cultures are more excited and expressive than other more stoic ones, leading possibly to differences in pain behavior rather than in the extent of pain felt. Fatigue and general debility, common in late gestation, may also contribute to the experience of labor pain [4].

The uterine cervix and corpus are supplied by afferent neurons ending in the dorsal horns of spinal segments T10–L1. As cutaneous afferents from the lower back converge to the dorsal horns in the same segments, there is anatomical support for the assumption that back pain in labor and symphysis pubis are referred pain [5,6].

Kinesiology taping originates in the science of kinesiology and is based on the belief that the body's muscles are responsible for the movements of and in the body as well as being in control of other elements such as the circulation of the blood and body temperature. As a consequence of this, when muscles fail or are impaired, other parts of the body are necessarily involved, thus putting their function at risk [7].

The kinesio taping method was developed by Kenzo Kase over 30 years ago. Kinesio taping has become the gold standard for therapeutic rehabilitative taping. Proprietary method of taping uses a uniquely designed and patented tape for the treatment of muscular disorders and lymphedema reduction [7].

Taping is defined as the application of adhesive tape-elastic (stretch) or nonelastic (rigid) to offer backup and protection to soft tissues and joints to minimize swelling pain after injury [8].

The kinesio tape is an elastic tape compared with conventional rigid tape. The nonstretch rigid tape is used to limit unwanted joint movement or to protect and support a joint structure [9].

The use of kinesio taping has become more and more popular. Kinesio taping was designed to mimic the tones of human skin. It delivers roughly the same thickness as the epidermis and can be stretched between 30 and 40% of its resting length longitudinally. Kinesio taping achieves rapid pain

relief, with an overall improvement in the range of motion and uninterrupted blood flow; it also assists in attaining an optimal healing process. An additional positive outcome is that kinesio taping raises the skin slightly and provides additional opening of the vascular system and significantly supports the lymph circulation [10].

Kinesio tape is theorized to have several usages: restoring correct muscle functions through supporting weakened muscles; reducing congestion by improving the flow of blood and lymphatic fluid; decreasing pain by stimulating neurological system and correcting misaligned joints by retrieving muscle spasm [10]; and cutaneous stimulation of the sensorimotor and proprioceptive systems. Taping provides immediate sensorimotor feedback as regards functional abilities [11].

Breathing exercise is considered as a key for relaxation and to reduce labor pain as it can assist the woman to cope with the pain of uterine contractions as well. Furthermore, it can be practiced during labor, to conserve the energy as much as possible and feed the baby plenty of oxygen to help the baby cope with the stress of being supported [12].

Breathing technique during labor is applied for relaxation, which increases pain tolerance through some mechanisms, including reduction of anxiety, decreased response to catecholamine, and reduced muscle tension [13].

Unfortunately, the literature review was unable to identify any study addressing the effect of kinesio taping combined with breathing exercises on childbirth duration and labor pain. Consequently, the purpose of the study was to evaluate the effect of kinesio taping combined with breathing exercises on childbirth duration and labor pain.

Participants and methods

Participants

A prospective, randomized, parallel group, active controlled study with a 1:1 allocation ratio was conducted at a research laboratory of Cairo University. Normal full-term primigravida women during the first stage of labor and with palpable uterine contraction were recruited from the Department of Obstetrics and Gynecology, Kasr El-Aini University Hospital, Cairo University. The women participated in the study after signing an informed consent form before data collection.

Recruitment began after approval was received from the Faculty of Physical Therapy Ethics Committee (reference number: P.T.REC/012/00690718-4/1/2015). Patients' ages ranged from 20 to 40 years, and their BMI did not surpass 30 kg/m². Participants were screened by the obstetrician before inclusion through full obstetrical examination, and the purpose and nature of the study was explained to all participants. The inclusion criteria were as follows: pregnancy with a normal single fetus; gestational age of 37 weeks or greater with a spontaneous onset of labor; cephalic presentation; a cervical dilatation between 3 and 5 cm at the start of the labor; anticipated normal labor; normal fetal heart rate; and being of the same socioeconomic standard (housewives with middle-level education). The exclusion criteria were as follows: presence of preeclampsia, heart or chest diseases, hemorrhage, fever higher than 38°C, rupture of membrane, breech presentation, cephalopelvic disproportion, uterine inertia, multiple pregnancies, fetal growth retardation, placenta previa, presence of skin abnormalities (skin malignancy or burns in the treated area), having acute viral disease, acute tuberculosis, and mental disorders, and a history of previous back surgery or sensory disturbances.

Randomization

The women were randomly assigned to the treatment group A ($n=20$) or the control group B ($n=20$) by an independent person who selected numbers from sealed envelopes containing numbers chosen by a random number generator. The randomization was restricted to permuted blocks of different sizes to ensure that equal numbers were allocated to each group A and group B. The sequences assigned to the participants were placed in envelopes containing the allocation to each group A and group B. An independent person who was blinded to the research protocol and not otherwise involved in the trial operated the random assignment.

The participants in the treatment group completed the treatment program consisting of breathing exercise and kinesio taping.

Treatment procedures

General management

For all women in both groups A and B admitted in labor, history was taken by the therapist and an examination performed by the nurse (temperature, pulse, respiration and blood pressure were checked, and urine was tested for glucose, ketone bodies, and protein). Abdominal examination was performed by the obstetrician by means of inspection, palpation, and auscultation to determine the fetal lie, presentation,

and position, and the station of the presenting part, as well as to determine the presence of a fetal heartbeat. Vaginal examination during labor was performed by the same obstetrician after cleansing of the vulva using an aseptic technique with sterile gloves and an antiseptic Savlon manufactured by Kahira pharmaceuticals, Arab Republic of Egypt. The following factors were noted: the consistency, effacement and dilatation of the cervix; whether the membranes were intact or ruptured; nature and presentation of the presenting part and its relationship with the level of the ischial spines; and assessment of the bony pelvis and, in particular, of the pelvic outlet.

All women in both groups A and B were instructed to evacuate the rectum by means of enema and advised to evacuate the bladder every 2 h to avoid uterine atony, and then they were advised to stop eating solid food. However, water and fluid intake was allowed. Furthermore, maternal pulse rate, blood pressure, and temperature were recorded by the nurse every 2 h, and the fetal heart sound was recorded every 30 min to detect fetal distress. Degree of cervical dilatation was assessed by means of vaginal examination every 1–2 h by the same obstetrician in all cases. The glucose saline solution was administered intravenously if needed (120 ml/h). At 5–6 cm of cervical dilatation, artificial membrane rupture was carried out by the obstetrician to increase the strength and frequency of uterine contraction, as the amniotic fluid is rich in prostaglandin hormone and the bathing of the cervix by this fluid increases the strength and frequency of uterine contractions, as well as to check the color of the fluid. When the mother could not tolerate the pain, intramuscular injection of nalbuphine (trade named Nubian) (20 mg) was used in both groups A and B, in most cases after rupture of membranes [14].

Intranatal management

Each woman in both groups A and B received the same intranatal management as follows:

- (1) The mother was asked to walk about between uterine contractions, as the weight of the head helps in mechanical dilatation of the cervix [15].
- (2) General relaxation was obtained through positioning in a fully supported, comfortable position chosen by each woman according to her satisfaction, which was either of the following positions:
 - (a) Sitting on the bed with a cushion behind her back or sitting on the bed with leaning forward on the cushions.

- (b) Side-lying or back-lying position when the mother lying in bed; she was advised to lie on her side to avoid supine lying position.

The mother was encouraged to change her positions to achieve the more comfortable position [16].

Breathing exercise: Participants in both groups A and B were aware of the procedures before starting the treatment. They were asked to breathe in slowly and deeply, keeping shoulders relaxed and the upper chest still. The mother was asked to breathe deeply during uterine contraction through diaphragmatic breathing exercises to gain relaxation, conserve the energy, and to allow proper oxygenation of the tissues during uterine contraction [17].

Diaphragmatic breathing: The mother was asked to choose the preferred position and to relax completely, and then the therapist asked her to take a deep inspiration from her nose, make her abdomen like a balloon by pushing her hands, which were placed on it and then expire out the air slowly from her mouth with a sigh and relax. The mother was advised not to strain during the first stage of labor to conserve her energy [18].

Costal breathing exercise: However, when the uterine contractions became stronger and frequent and the cervical dilatation was increased, the therapist asked the mother to perform a costal breathing exercise. From any comfortable position, the therapist asked the mother to take a deep breath from her nose, and then open out her ribs and expire the air from her mouth with a sigh slowly and relax [18].

Kinesio taping

Specifications: product, size, 5cm × 5m; color, beige [19] manufactured by 3NS TEX, made in New Delhi- India.

Participants in group A received the kinesio tape at the lumbosacral region on the first stage of normal labor (when cervical dilatation was between 3 and 5 cm) and at the anterior lower abdomen region (when cervical dilatation became 7–8 cm).

This phase of treatment was classified into various phases.

Preparatory phase

- (1) The skin was cleaned before the application of tape.

- (2) The skin was rendered free of oils and lotions.
 (3) Body hair were clipped or shaved at the area of application.
 (4) Anything that limited the acrylic adhesive ability to adhere to the skin would limit both the effectiveness and length of application [19].

Application phase:

- (1) *Site:* The site of application was the lumbar region on bilateral erector spine muscle.

Technique: the 'H' technique of application was adopted.

Mechanism and direction: After the preparatory procedures [19], bilateral kinesio 'T' strip was applied on para spinal muscles (at the level of T10–S2 – this corresponds to the area that provides the uterine nerve supply) [20]. Each participant was asked to flex her back, and after that the therapist applied the kinesio tape to the base with no tension and then applied very light tension (15–25% of available tension) when the tail of the tape was ~1–2 inches from the end, stopped tensing, and laid the end down with no tension. Subsequently, the applied tape strip was rubbed to initiate glue adhesion before moving the muscle from its current stretched position. Later, the third strip was applied horizontally as a space correction technique (100% tension), as shown in Fig. 1[21].

Figure 1



Applying kinesio tape H technique.

- (2) *Site*: The site of application was at the lower abdomen region.

Technique: The 'I' technique of application was adopted.

Mechanism and direction: The tape was wrapped from the left lateral side of the last three ribs laterally toward the anterior lower abdomen, and then backward toward the right lateral side of the last three ribs laterally using the I technique of application. An overall 25% tension was applied on the tape. To smoothly remove the paper after the delivery, the examiner holds the tape vertically, with the index finger placed on the top edge of the tape, and then rolls back the index finger toward the patient; the tape would peel from its backing, as shown in Fig. 2[22].

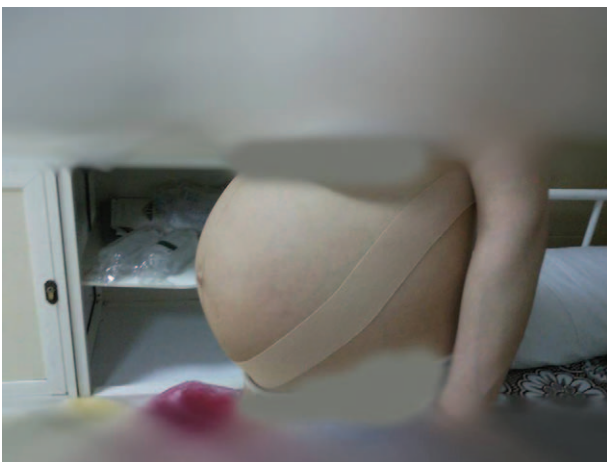
Participants in group B received only conventional medicine during normal labor in addition to breathing exercises.

Outcome measures

The primary outcome measures for determining treatment assessment were labor pain intensity level, duration of the first stage of labor, and monitoring the fetal heartbeat, which consists of the visual analogue scale (VAS), cardiotocography, and the stopwatch. The reliability, construct validity, and responsiveness to change had all been demonstrated in various populations [23,24].

The outcome measures used to compare the treatment effectiveness among the two groups (A and B) included the following.

Figure 2



Applying kinesio tape I technique.

Weight and height were measured for each woman. Thereafter, BMI was calculated by dividing weight (kg) by height squared (m^2). Each participant in the two groups passed through the following steps of evaluation.

Visual analogue scales

A VAS was used to assess the pain intensity level. It is a 10 cm horizontal line with one end described as no pain (0) and other end described as worst pain (10) [25]. The assessment was performed after the end of 'H' technique kinesio taping application (when cervical dilatation became ≥ 3 to ≤ 5 cm) and repeated after the end of 'I' technique kinesio taping application at 7–8 cm cervical dilatation for both groups A and B.

Stopwatch

It was used to measure the duration of the first stage of labor, which is defined as the time between cervical dilatation (≥ 3 to ≤ 5 cm) and complete dilatation.

Cardiotocography

It was used to monitor fetal heartbeat at the first stage of normal labor for all participants in both groups A and B. Two belts were put across the abdomen during labor, one at the top to check for any contracting of the uterus and one at the place where the baby's heartbeat is found. Specifications: high sensitivity (1 MHz); alarm on abnormal fetal heart rate; dimensions, 269 (W) \times 305 (H) \times 92.5 (D); ~ 2.9 kg; display: seven-segment LED and two channels; power adaptor: input, 100–240VAC, 50–60 Hz, 1.2A; output, 18VDC, 2.5A.

Sample size determination

Power analysis was performed using a general power analysis program (G*Power 3.0.10; developed by Franz Faul, Uni Kiel, Kiel, Germany). The power calculation was used to determine the minimum sample size, assuming an α of 0.05 at 80% power, based on an effect size of 0.55. A sample size of 20 patients per group would be required.

Statistical analysis

Data were represented as means and standard deviations. It was considered significant at P -value less than 0.05 and highly significant at P -value less than 0.001. Comparison between the mean values of different variables in the two studied groups (A and B) was made using the unpaired t -test. Statistical package for the social sciences (SPSS) computer program (version 16 for Windows; SPSS Inc., Chicago, Illinois, USA) was used for data analysis.

Results

A diagram of the participant's retention and randomization throughout the study is shown in Fig. 3. A total of 65 participants were initially screened. After the screening process, 40 participants were found to be eligible to participate in the study. In total, 40 (100%) participants completed the treatment program, and 40 completed the entire study.

Physical characteristics of the pregnant women in both groups A and B

Table 1 represents the general characteristics for all pregnant women in both groups A and B when enrolled in the study. There was no significant difference between the two groups as regards their ages, BMI, and duration of pregnancy; their *t* values were 0.75, -0.997, and -0.433 and the *P* values were 0.45, 0.325, and 0.667, respectively.

Duration of first stage of labor

Table 2 represents the duration of the first stage of labor for both groups A and B. There was a highly statistically significant difference between group A and group B in the duration of the first stage of labor as revealed using the unpaired *t*-test, favoring group A; the *P*-value was 0.001, and the *t*-value was -4.114 (Fig. 4).

Pain intensity using visual analogue scale in the first stage of labor

Table 3 represents the pain intensity using VAS in the first stage of labor for both groups A and B. There was

a nonsignificant difference between group A and group B in the pain intensity using VAS in the first stage of labor at the first reading (cervical dilatation: 3–4 cm) ($P=0.373$, $t=0.902$). However, there was a highly

Table 2 Duration of the first stage of labor (h) for both groups A and B

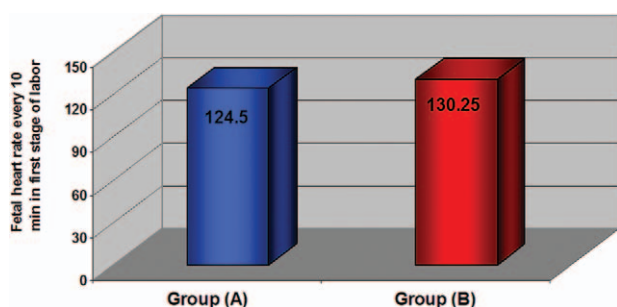
Duration of the first stage of labor (h)	Group A	Group B
Mean±SD	5.15±0.91	6.20±0.70
<i>t</i> -Value	-4.114	
<i>P</i> -value	0.001	
Significance	HS	

Table 3 Pain intensity using visual analogue scale in the first stage of labor for groups A and B

VAS scores	Mean±SD		<i>t</i> -Value	<i>P</i> -value	Significance
	Group A (n=20)	Group B (n=20)			
First reading (cervical dilatation: 3–5 cm)	4.75±0.64	4.95±0.76	0.902	0.373	NS
Second reading (cervical dilatation: 7–8cm)	7.80±0.83	9.10±0.72	-5.284	0.001	HS

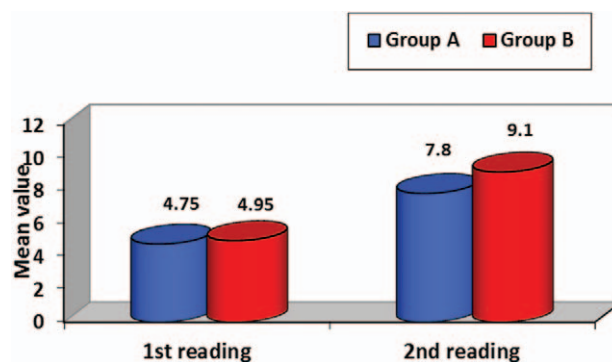
HS, highly significant; VAS, visual analogue scale.

Figure 3



Flow of study participants.

Figure 4



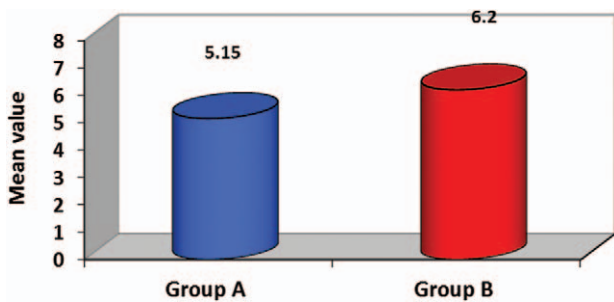
Mean values of duration of the first stage of labor, in both groups A and B.

Table 1 General characteristics of the participants in both groups A and B

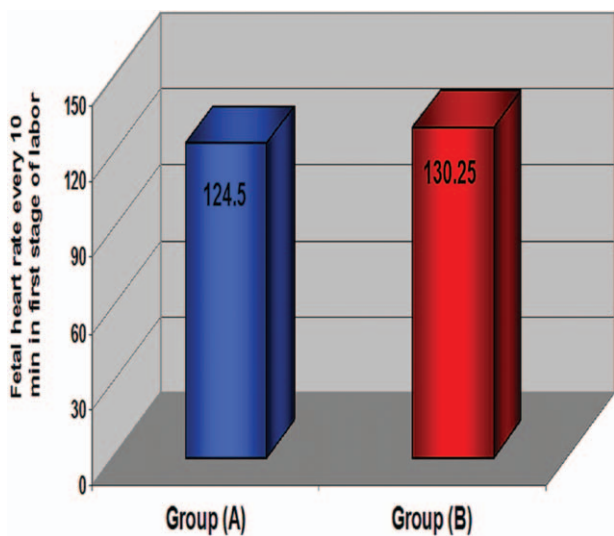
General characteristics	Mean±SD		Comparison		
	Group A	Group B	<i>t</i> -Value	<i>P</i> -value	Significance
Age (years)	27.55±2.18	28.2±3.18	0.75	0.45	NS
BMI (kg/m ²)	29.40±1.93	28.95±1.54	-0.997	0.325	NS
Duration of pregnancy (weeks)	38.50±1.05	38.65±1.14	-0.433	0.667	NS

Table 4 Fetal heart rate every 10min in the first stage of labor for both groups A and B

Fetal heart rate every 10min in the first stage of labor	Group A	Group B
Mean \pm SD	124.6 \pm 10.98	130.24 \pm 11.42
Mean difference	5.64	
t-Value	1.62	
P-value	0.11	
Significance	NS	

Figure 5

Mean values of intensity of the labor pain assessed using the visual analogue scale in both groups A and B.

Figure 6

Mean value of the fetal heart rate every 10min in the first stage of labor for both groups A and B.

significant difference in the second reading (cervical dilatation: 7–8 cm; $P=0.001$, $t=-5.284$), favoring group A (Fig. 5).

Fetal heart rate every 10min in the first stage of labor

Table 4 demonstrated the fetal heart rate every 10 min in the first stage of labor for both groups A and B.

There was a nonsignificant statistical difference between group A and group B in the fetal heart rate every 10 min in the first stage of labor, as revealed using the unpaired t -test (Fig. 6).

Discussion

The results of the present study revealed that kinesio taping combined with breathing exercise is effective in minimizing labor pain and shortening the duration of the first stage of labor.

There was a highly statistically significant decrease in pain intensity in patients who underwent normal labor using kinesio taping combined with breathing exercises than in those using a breathing exercise during normal labor as it was indicated by a decrease in VAS in group A than in group B.

This study is in accordance with the study by Bishop [26], who examined the impact of KT on 37 patients with low back pain in a randomized controlled study. They showed that there was a significant reduction in pain intensity.

Using kinesio taping, one achieves rapid pain relief, with an overall improvement in the range of motion and uninterrupted flow of blood. This removes any hindrances to an optimal healing process. An additional positive side effect is that kinesio taping raises the skin slightly. This provides an additional opening of the vascular system and significantly supports circulation of the lymph [27].

Kinesio taping alleviates pain and facilitates drainage of lymphatic fluid by microscopically lifting the skin. The taped portion forms convolutions in the skin, thus increasing interstitial space. The result is that pressure and irritations are taken off the sensory and neural receptors, alleviating pain. Pressure is gradually taken off the lymphatic system, allowing it to drain more freely [28].

Fredericson *et al.* [29] stated that impacting localized fluid circulation when applied to the skin kinesio taping is reported to lift the upper layers of skin, creating an extraspace between the skin and the underlying muscles. This space is believed to decrease pressure on the lymph channels and create more space for circulation and flow and improves drainage of the lymph through the taped area. This could help in decreasing the swelling and pain in the injured areas.

Using kinesio taping improves blood circulation, increases blood flow to and from the muscle and

enhances the presence of oxygen and nutrients to assist with repair of damaged tissues, and accelerates the breakdown and removal of waste products when muscles are fatigued [29].

In agreement with the results of the current study, Fu *et al.*[30] reported that application of kinesio tape is believed to transmit information to the cerebrum that results in continuous contraction of the muscle and provide stable muscle tension by repetitive muscle contraction and relaxation. It also increases the space between the skin and the muscles, decreases pressure, and increases circulation of the lymphatic fluid, minimizing pain, and thereby improving function of the muscle.

Mehdizadeh *et al.*[31] reported that breathing exercises had helpful and positive effects on labor pain.

Furthermore, the results of the study are supported by those of Kamali Fard *et al.*[12] and Tafazoli *et al.*[32]. They showed that breathing technique in 4, 6, and 10 cm dilation significantly minimized labor pain. The results of Kamali Fard *et al.*[12] showed that breathing technique significantly reduced cesarean rate. Tafazoli *et al.*[32] also showed that breathing significantly shortened the first stage of labor and decreased the need for induction, but had no significant effects on Apgar scores and rate of cesarean section.

In addition, Nabb *et al.*[33] evaluated the effects of massaging and breathing on 35 mothers. The results showed that 21 participants finished the labor without analgesia, seven participants inhaled Entonox, and two participants underwent epidural anesthesia.

The results are supported by the work of Yildirim and Sahin [34], who studied the effect of breathing and skin stimulation techniques on the labor pain perception of Turkish women. They concluded that breathing and cutaneous stimulation techniques when provided in the latent labor phase were effective in decreasing pain perception by pregnant women during labor, resulting in a better satisfactory birth experience.

Study limitations

Our analysis has potential limitations, each of which indicates directions for future study. The primary limitation was the difference between the individual participants and their ability to tolerate labor pain, as well as the psychological status of the pregnant women during the treatment period. Every effort was made to overcome these limitations by including the participants of the same socioeconomic standard

(housewives with middle-level education), but the tolerability to pain differs from one individual to another. Within these limitations, the unique contribution of our study is that it evaluated the effect of kinesio taping combined with breathing exercises on childbirth duration and labor pain, which have not previously been reported. We believe that the results of this study should be used to introduce new guidelines for the relieving of labor pain.

Conclusion

The addition of kinesio taping to breathing exercise was effective, more comfortable, and safe for both of the mother and the fetus. There was a statistically significant reduction in both labor pain intensity and duration of the first stage of labor. Accordingly, it was found that kinesio taping combined with deep breathing exercise appeared to be an effective, noninvasive, cheap, and safe method of relieving pain during labor.

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Conflicts of interest

There are no conflicts of interest.

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