

EFEITO DO KINESIO TAPE NA TEMPERATURA DA PELE NO TRAPÉZIO SUPERIOR EM INDIVÍDUOS SAUDÁVEIS

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Resumo: A Kinesio Tape é uma fita adesiva elástica utilizada na prevenção e reabilitação de lesões ocupacionais, repetitivas e esportivas. Entretanto, poucos estudos investigam os efeitos da bandagem elástica na temperatura da pele. O objetivo do estudo é verificar o efeito imediato da Kinesio Tape na temperatura da região do músculo trapézio superior em indivíduos saudáveis. Participaram 25 estudantes universitários, os quais foram submetidos a aplicação da Kinesio Tape em forma de “Y” sobre o músculo trapézio superior. Foram realizadas capturas termográficas com e sem KT e exportadas para o software FLIR Tools onde foram estimados os mínimos, máximos e médias da temperatura da pele na região entre as tiras aplicadas. As temperaturas com e sem KT foram comparadas através do teste t pareado. Não foram encontradas diferenças nos mínimos ($p = 0,283$), máximos ($p = 0,783$) e médias ($p = 0,377$) na temperatura da pele do trapézio superior na região entre as tiras da KT. Dessa forma, não houve efeito da Kinesio Tape sobre a temperatura da pele no músculo trapézio superior em indivíduos saudáveis. Estudos futuros devem buscar avaliar áreas abaixo ou ao redor das tiras aplicadas, bem como com diferentes metodologias como ensaios clínicos randomizados com grupo controle ou placebo para investigar os efeitos da KT na temperatura da pele.

Palavras-chave: Bandagem elástica; Termografia, Temperatura, Cervical.

Afiliação

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THE SHORT-TERM EFFECTS OF KINESIO TAPE ON THE SKIN TEMPERATURE OF THE UPPER TRAPEZIUS MUSCLE IN HEALTHY INDIVIDUALS

Abstract: Kinesio Tape is an elastic adhesive tape used in the prevention and rehabilitation of occupational, repetitive and sports injuries. However, few studies investigate the effects of kinesio tape on skin temperature. The objective of the study is to verify the immediate effect of Kinesio Tape on the temperature of the upper trapezius muscle region in healthy individuals. 25 university students participated, who received Kinesio Tape in a “Y” shape on the upper trapezius muscle. Thermographic captures were performed with and without KT and exported to the FLIR Tools software, where the minimum, maximum and average skin temperature in the region between the applied strips was estimated. Temperatures with and without KT were compared using the paired t-test. No differences were found in the minimum ($p = 0.283$), maximum ($p = 0.783$) and average ($p = 0.377$) skin temperature of the upper trapezius in the region between the KT strips. Thus, there was no effect of Kinesio Tape on skin temperature in the upper trapezius muscle in healthy individuals. Future studies should seek to evaluate areas under or around the applied strips, as well as with different methodologies such as randomized clinical trials with a control group or placebo to investigate the effects of KT on skin temperature.

Key words: Kinesio Tape; Thermography; Skin temperature; Cervical.

Introduction

Kinesio Tape (KT) is an elastic adhesive tape used in the prevention and rehabilitation of occupational, repetitive and sports injuries^{1,2}. Mechanical and proprioceptive mechanisms are related to tape effectiveness to decrease pain, support, muscle inhibition and facilitation along with enhancing blood flow and lymphatic circulation^{3,4}. However, the current evidence⁵⁻⁸ does not support the use of the intervention and the suggested effects^{7, 9, 10}, especially related to blood flow and lymphatic circulation^{7, 11-13}.

Literature indicates that changes in blood flow reflected from vasoconstriction and vasodilation can result in changes in the skin temperature¹⁴. The skin temperature is around 33°C, which differs from the intramuscular temperature of 35°C¹⁵⁻¹⁷. Therefore, thermography is a non-invasive tool that evaluates the skin temperature and has been used to reflect presence of inflammation in underlying tissues, increase or decrease in blood flow and the helping of complementary diagnostics¹⁸. Considering that KT may affect the blood flow and lymphatic circulation, thermography can help in understanding the effects of KT through the skin temperature evaluation.

Thermography studies on the literature investigated KT effects over the lumbar/paravertebral region^{11, 14, 19, 20}. However, the results of the effects of KT on the skin temperature are contradictory, having increased^{14, 19}, decreasing^{11, 20} and no change on temperature immediately¹⁴ and after 15 minutes²⁰. Besides the different results, another important aspect is that some studies evaluate the skin temperature after the removal of I-shaped tape, where friction of the applicator and glue below the tape may still be on the individuals skin, which will affect the skin temperature. Therefore, evaluation in areas between Y shaped strips^{14,19}, where the applicator does not have contact are helpful to investigate the effects of KT on skin temperature.

Another aspect is the scarcity of studies that involve the effects of KT on the temperature in the cervical region. Several studies investigated the effects of KT over the upper trapezius muscle, suggesting decrease pain²¹⁻²³, disability²², increase on range of motion^{21, 22} and inhibition of the electromyographic activity of the upper trapezius muscle²⁴⁻²⁸. However, from our understanding, there are still no studies that investigated effects of KT on temperature in the region of the upper trapezius muscle.

Therefore, the study aims to verify the short-term effects of Kinesio Tape on the skin temperature of the upper trapezius muscle region in healthy individuals. Based on the literature^{14, 19}, the hypothesis of the study is that the application of Y shaped tape over the

upper trapezius muscle will result in an increase in the skin temperature on the area between the strips.

Materials and Methods

Participants and study design

A sample of university students with no pain and no history of musculoskeletal conditions of the spine were recruited to participate in the study. Subjects were excluded if they showed signs of one of the following: 1) cervical pain within 6 weeks prior to data collection; 2) sensitive changes, syndromes or who had a neurological disease associated with temperature; (3) history of fractures in the spine, head or shoulder complex; (4) skin lesions or some type of dermatological allergy and (5) use of medications that influence blood flow. The study was approved by the Ethics Committee of the Centro Universitário da Serra Gaúcha (FSG), under No. 3.147.219 based on the Declaration of Helsinki and each individual signed the free informed consent.

Procedures

Data collection was performed by two researchers at Centro Universitário da Serra Gaúcha (FSG) in a test room (3x6m²) previously acclimatized (23°C). Initially, the participant undressed in the torso and upper limb region, having to wait 20 minutes in the room only in the presence of the researchers. The individual could sit, but could not touch or support any surface. During this waiting period, participants were asked for anthropometric data (age, weight, height). After the requested time, the participant was instructed to position him/herself in orthostasis in front of a wall and with his/her back to the researchers.

At this moment, the thermography image was captured with the FLIR C2® camera, precision-10-150c, $\pm 2\%$ sensitiveness, 100mk, emissivity 0.98 and spectral mode (640x480 pixels). The camera was fixed to an adjustable tripod with a one-meter distance from the participant. After capturing the image, the subject sat and the Y-shaped elastic tape (Kinesio Tex Gold®) was applied over the upper trapezius²⁵. Initially, the proximal anchor was fixed on acromion, then the individuals were asked to rotate the head to the left with a lateral flexion. The inferior strip was applied in the direction of the thoracic spine passing through

the trigonum spinae while the superior strip was applied in the direction of the cervical spine (Figure 1). The participant again waited 20 minutes for the skin temperature to normalize and the thermographic image was captured with the same configurations previously mentioned.



Figure 1 - Y shaped tape

Data analysis

Data analysis (Figure 2) was completed using the FLIR Tools (®) software, where the region of interest (ROI) between the strips of the Y-shaped tape over the region of upper trapezius muscle were demarcated. First, one line was traced in the space between the strips of the Y-shaped tape¹⁴. The same line was marked on the individual without the Y-shaped tape. For each individual, the minimum, maximum and average were exported from the line.

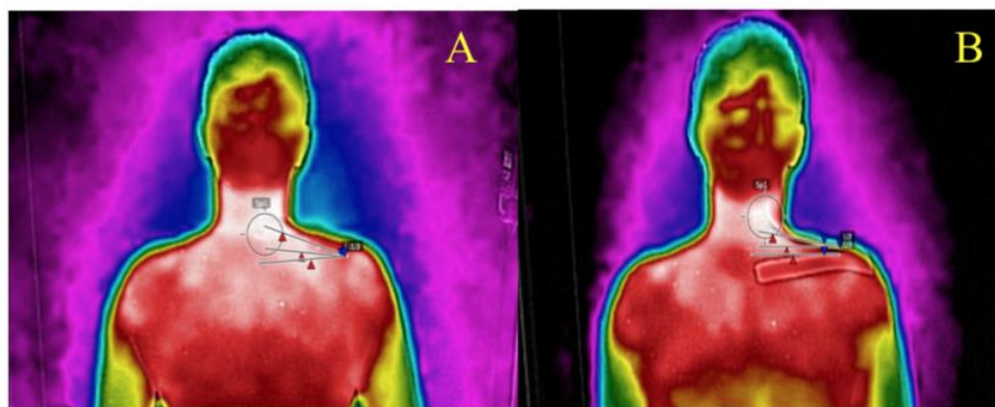


Figure 2 - Data analysis. Legend: A= Baseline; B= KT

Statistical analysis

Statistical analysis was performed using SPSS v20.0 software. Initially, data normality was verified by Shapiro-Wilk test. The comparisons of minimum, maximum and average temperature of the upper trapezius region were performed by paired *t* test. Statistical results were reported by mean difference (*d*), the value of the *t* test, level of significance (*p*-value) and effect size (*r*) [$\sqrt{t^2/t^2+df}$] 29. The level of significance was 5%.

Results

Twenty five university students (age, 24.9 ± 5.3 years [mean $\pm$ SD]; mass 66.3 ± 10.5 Kg; height 167 ± 9.4 cm; 10 male and 15 female) were recruited to participate in the study. There was no difference between the minimum ($d = 0.25$; $t = 1.099$; $p = 0.283$; $r = 0.22$), maximum ($d = 0.05$; $t = 0.279$; $p = 0.783$; $r = 0.05$) and average ($d = 0.18$; $t = 0.9$; $p = 0.377$; $r = 0.18$) skin temperature after the KT application over the upper trapezius muscle (Table 1). Figure 2 shows the scatter plot of the sample results.

Table 1 - Minimum, maximum and average of the skin temperature (°C) without and with KT over the upper trapezius muscle.

Outcome	Baseline	KT
Minimum	33.04 ± 1.09 °C	32.86 ± 1.24 °C
Maximum	33.84 ± 1.06 °C	33.70 ± 1.10 °C
Average	33.57 ± 1.04 °C	33.34 ± 1.14 °C

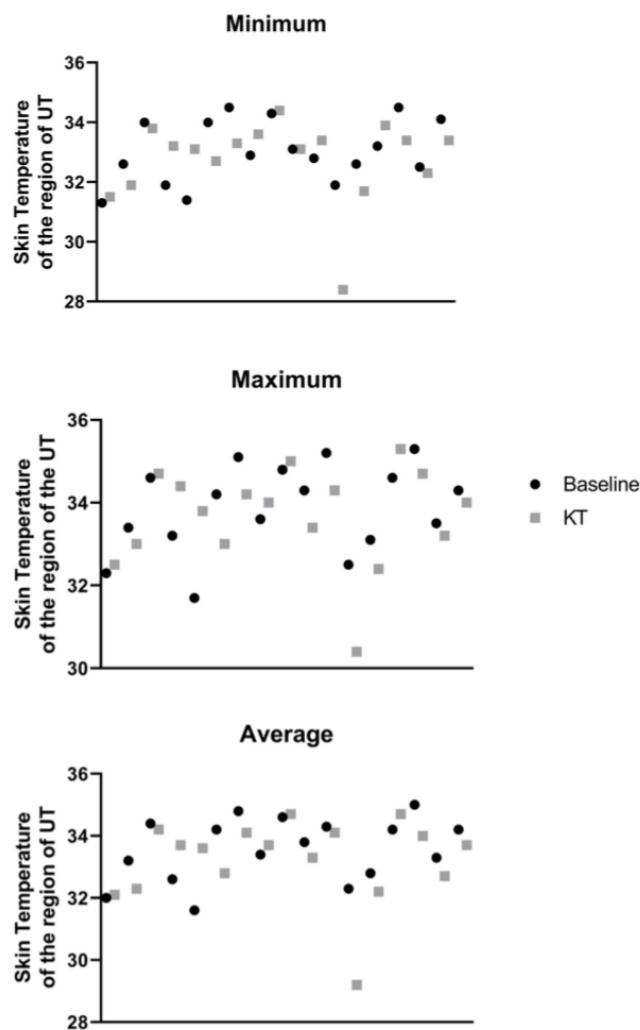


Figure 2 - Scatter plot with the minimum, maximum and average skin temperature of the upper trapezius region of the sample group with and without KT

Discussion

The study aimed to verify the short-term effects of Kinesio Tape on the skin temperature of the upper trapezius muscle in healthy individuals. Our results reject our first hypothesis and there was no effect of KT on the skin temperature between the strips of the upper trapezius. The literature related several different results on skin temperature after the application of KT, as increase^{14,19}, decrease^{11,20} and no change on temperature immediately¹⁴ and after 15 minutes²⁰. We expected an increase in skin temperature of the upper trapezius

since the analysis of the space between the strips was evaluated in previous studies^{14, 19}. Differences on KT application and evaluation methods may explain the different results.

Liu et al¹⁴ found an increase in skin temperature with a fan-strip tape, but found no difference with a Y-shape tape which coincides with our results. Rachenjuk et al¹⁹ found an increase in temperature between the Y-shape tape on the lumbar, but the analyzed method was different with a ball on the distal anchor instead of a line between the areas of strips. The study explains that the increase in temperature is probably due to thermal insulation properties of the KT and a reflex hemodynamic response of the blood vessels. If there is a possibility of influence of KT between the strips, the distance between the strips and the ROI need to be considered. We can assure that there is influence of KT on medial or lateral borders of the tape, therefore, future studies should try a systematic approach to analyze the borders and evaluate different designs of KT shapes. Shapes such as donut-strip, O-strip or Y shaped involving minor areas may cause more proximity of the strips and therefore show some effects.

On the other hand, it is possible to consider that KT effects may be limited to the areas below the application of the strips and therefore no effect will be found in the space between strips. It is suggested that during the application of KT the participant should be in a stretched position to posteriori creating wrinkles in the skin which may help to increase space under the skin and therefore increase blood flow and lymphatic circulation^{3, 20}.

Slomka et al¹¹ evaluated the skin temperature in the lumbar region using the I-shaped tape in an experimental and control group and found an increase in the temperature of the experimental group on areas below KT. However, the exact mechanisms are not elucidated¹¹ and therefore, there is no effect on skin temperature with wrinkling tape²⁰. Although skin surface temperature is closely associated with subcutaneous perfusion and tissue metabolism, with the emitted infrared radiation possibly reflecting an increase or decrease in local perfusion¹⁴. The skin was covered by the tape and the temperature evaluated on these areas won't reflect the reality below the strips, so the tape might play a role in insulating the skin on the covered area.

There are some limitations in the study. First, the study is limited to skin temperature in the space between the strips, being unknown the effects in the region below the application of the strips on the upper trapezius muscle. Such a result does not exclude the use of KT on rehabilitation or prevention, it just gives an indication that may have no effect on the space between the strips. We have tried to minimize the possible interference of the ambient and

physiological variability (temperature of the environment, mental stress, vasoactive agents and sweating) leaving the place with an adequate temperature on the collection day. And for the same reason, we evaluated just short-term effects. During data analysis, we chose to use the lines, since the other options of the software would not fit properly. However, even so, there may be some evaluator- dependent errors. Our study brought evidence of the possible effects of KT on the cervical region showing that there was no effect on the skin temperature on the trapezius muscle between the strips. Despite the limitations of the study, it is clear that the study presents a new perspective and evidence that the skin temperature or muscle temperature variables should be investigated, especially with the use of KT. In addition, thermographic evaluation still presents many debates and challenges in the literature.

Therefore, further investigations (control group, random days, different designs, varied tensions, areas below the application region) should be carried out to evaluate the skin temperature with the use of KT in the cervical region.

Conclusion

There was no effect of Kinesio Tape on the skin temperature of the upper trapezius muscle in healthy individuals. Future studies should try to evaluate areas below the strips or around involved areas. Further investigations with different methodologies are needed to evaluate KT effects on skin temperature.

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