

Can the application of the Ergon® IASTM treatment on remote parts of the Superficial Back myofascial line be equally effective with the local application for the improvement of the hamstrings’ flexibility? A randomized control study.

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Abstract

[Purpose] This study aimed to investigate the effects of Ergon® Instrument-Assisted Soft-Tissue mobilization (IASTM) applications on the upper or lower part of the Superficial Back Line (SBL) on the hamstring’s flexibility. [Methods] Sixty University students (40 men, 20 women, age=24.4 ± 4.39; height=176.78 ± 8.31 cm; weight=75.16 ± 11.21 kg) were randomly divided into three (3) research sub-groups and received a single 15-minute myofascial treatment with Ergon® IASTM Technique in a) the upper (trunk-neck) and b) the lower part of SBL (posterior surface of lower extremity: thigh, calf, foot) or c) served as control. The participants received one (1) treatment per week for four (4) weeks with a simultaneous pre-and post-therapy assessment of their hamstrings flexibility using the passive Straight Leg Raising (SLR). [Results] Both experimental groups improved SLR performance from pre to post during the four weeks from 4.4% to 9.2% in the Trunk group (p<0.001) and from 4.9% to 8.0% in the lower body group (p<0.001). These differences were significantly greater from the CTRL group (p<0.01). No differences were observed between the two experimental groups (p>0.05). Furthermore, post hoc analyses showed that trunk experimental group increased significantly SLR performance after the interventions in the following four weeks compared with the pre-value of week 1 from 6.2% to 18.2% respectively (p<0.01). Furthermore, the lower body group improved SLR performance compare with the pre-value in the following weeks from 6.6% to 17.0%, respectively. In contrast, the SLR performance was not improved in the CTRL group (p>0.05).

[Conclusion] In conclusion, treatment of either the upper or lower part of the Superficial Back line may lead to a significant increase in the hamstring flexibility. Impressively, applying techniques to distant points (trunk) led to the same improvement in the hamstrings flexibility by applying local treatment to them. The above findings can be explained by the myofascial transmission of tension and by the neurophysiological reduction of muscle tone.

Introduction

In recent years, the study and treatment of myofascial pathologies is an essential element of the rehabilitation of human neuro-musculoskeletal pathologies. On that basis, many soft-tissue techniques and methods of myofascial therapy have been developed aiming at a more holistic evaluation and treatment of the human body.

Most of these techniques are based on the work of Thomas Myers, who has defined a set of 12 myofascial continuities-meridians that cover almost all the surfaces of the human body at all levels.¹ Of the most evidence-based² and important lines, the superficial Back line (SBL) connects and protects the entire posterior surface of the body (from the base of the foot to the top of the head). The overall static function of the SBL lies in supporting the body to the extension in an upright position and preventing the tendency to bend in flexion as in the fetal position.¹

Given the functional importance of the SBL, Wilk et al,^{3,4} conducted 2 randomized control studies to evaluate the effect of static stretching in distant portions of the SBL in other remote segments of the line. Their findings proved that a single session of static stretching could produce acute flexibility increases at distant joints thus demonstrating the existence of a strain transfer along the SBL.^{3,4} Surprisingly, and even though the Superficial Back Line is associated with injuries and pathologies of high epidemiological incidence (neck pathologies, back pain, hamstrings strains, etc.), there is no research evaluating the effect of specialized soft tissue techniques like Instrument-Assisted Soft-Tissue mobilization (IASTM) techniques on the elasticity and functionality of this myofascial line. The most known IASTM techniques are the Ergon® Technique and Graston® Technique which both constitute a manual therapy approach combining static and dynamic soft tissue manipulation with specialized clinical equipment-tools, aiming to treat soft tissue restrictions and to improve tissue flexibility, joint range of motion and patient functionality.

Based on the above, the purpose of the present study is to evaluate the effects of Ergon® IASTM Technique applications in the posterior trunk and thigh in the flexibility of the Superficial Back Line. In particular, this study aims to investigate the effects of Ergon® IASTM applications on the upper or lower part of the superficial Back Line on the Hamstrings flexibility.

Method

Study design and participants

This investigation was a randomized control study. The sample consisted of 60 University students (40 men, 20 women, age=24.4 ± 4.39; height=176.78 ± 8.31 cm; weight=75.16 ± 11.21 kg), recruited from the Physiotherapy Department of Technological University of Western Greece. Inclusion criteria were: a) decreased trunk-hamstrings flexibility (<22 as measured by Sit and reach test), and b) no injury at least one year before testing. The sample was grossly homogeneous in potential confounding variables, such as weight, height, age, and hamstrings flexibility. All participants were informed about the research

processes and signed written consents. The study was approved by the ethical committee of Scholl of Health Sciences of the Technological Educational Institute of Western Greece.

Procedures

The participants (N=60) were randomly divided into three (3) research sub-groups and received a single 15-minute myofascial treatment with Ergon® IASTM Technique in a) the upper (trunk-neck) and b) the lower part of SBL (posterior surface of lower extremity: thigh, calf, foot) or c) served as control. The Ergon® IASTM Technique is an innovative soft-tissue technique with significant research evidence of its effectiveness in a) reducing pain in painful syndromes and b) improving patient function regarding the increasing range of motion.^{5,6} The Ergon® IASTM Technique involves the application of specialized IASTM Strokes that are either linear (Rub, Wave, Snake, Cyriax, Switch), semicircular or circular (Razor, Globe, Small Globes, Excav), applied to specific points of myofascial restrictions. Also, it has particular strokes for the separation of the myofascial structures (SEP, SPLIT) and the treatment of areas with fascial adhesions (Cyriax, Switch).

The whole research procedure took place over four (4) weeks, during which they received one (1) treatment per week with a simultaneous pre-and post-therapy assessment of the research variables. Pre and post each myofascial treatment with Ergon® IASTM Technique, the passive Straight leg raising (SLR) was used for the evaluation of hamstrings flexibility. The hip flexion angle (ROM) in SLR was evaluated using an, a Smartphone (I phone 6s-Goniometer Version 2.7) goniometer. This specific application according to Jones et al.,⁷ it is a valid and reliable means of measuring the hip ROM of the Passive straight leg raise test (SLR) as it is reliable with universal goniometers. Three measurements were carried out in all the tests, and the average of these (on each side) was used for later analyzes.

Statistical Analyses

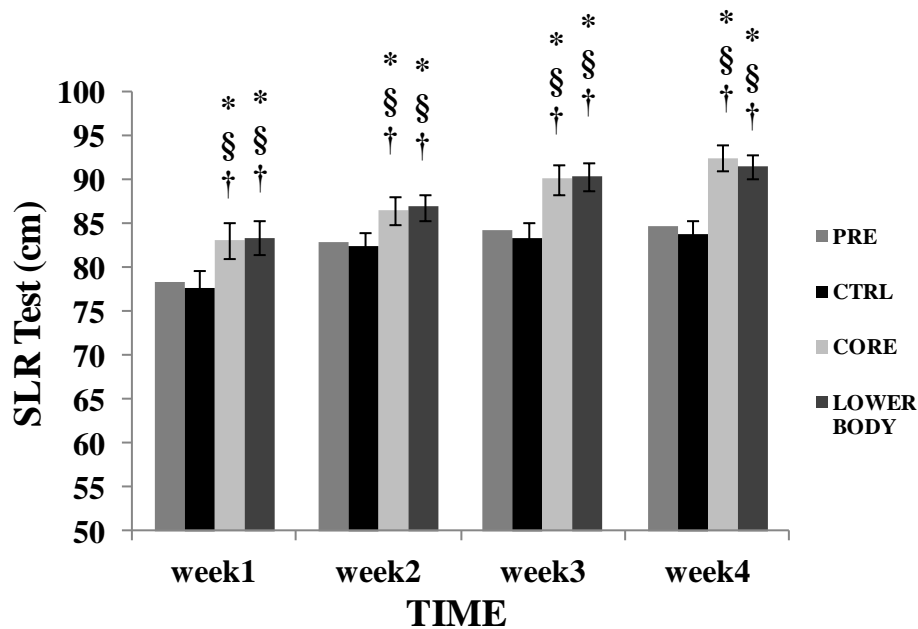
Two-way mixed (between-within subjects effects) analysis of variance (3 groups x 4 pre values) was used to identify differences between pre-values of the groups. When a significant two-way ANOVA was found, Bonferroni's post-hoc tests was used. Multiple 3-way mixed factor ANCOVA (3 groups x 4 weeks x 2 time points [pre-post]) were conducted to examine the acute and short-term effect of interventions in the performance of flexibility test by using the pre-values as covariates. Bonferroni post-hoc tests was used when a significant interaction was observed. Partial eta squared (η^2) values were used to estimate effect sizes (small: 0.01 to 0.059, moderate: 0.06 to 0.137, large >0.138). All statistical analyses were performed using SPSS (IBM SPSS Statistics Version 23). Data are presented as adjusted mean \pm 95% confidence interval. Statistical significance was set at $p < 0.05$.

Results

Pre values in the SLR test were significantly different between groups ($p < 0.01$). The 3-way ANCOVA interaction was not significant ($p = 0.44$, $\eta^2 = 0.03$). However there was a 2-way group x week interactions ($p < 0.001$, $\eta^2 = 0.22-0.56$) as well as a 2-way group x time (pre-post) interaction ($p < 0.001$, $\eta^2 = 0.68$). Bonferroni post-hoc tests revealed that both experimental groups improved SLR performance from pre to post (figure 1) during the four weeks from 4.4% (Δ : -3.65 cm, CI95%: -5.26 cm to -2.05 cm, $p < 0.01$) to 9.2% (Δ : -7.78 cm, CI95%: -9.19 cm to -6.36 cm, $p < 0.01$) in the Trunk group ($p < 0.001$) and from 4.9% (Δ : -4.04 cm, CI95%: -5.55 cm to -2.52 cm, $p < 0.01$) to 8.0% (Δ : -6.82 cm, CI95%: -8.15

cm to -5.48 cm, $p < 0.01$) in the lower body group ($p < 0.001$). These differences were significant greater from CTRL group ($p < 0.01$). No differences were observed between the two experimental groups ($p > 0.05$). Furthermore, post hoc analyses showed that trunk experimental group increased significantly SLR performance after the interventions in the following four weeks compare with the pre value of week 1 from 6.2% (Δ : -4.89 cm, CI95%: -7.83 cm to -1.95 cm, $p < 0.01$) to 18.2% (Δ : -16.59 cm, CI95%: -20.27 cm to -12.90 cm, $p < 0.01$) respectively ($p < 0.01$). Furthermore the lower body group improved SLR performance compare with the pre value in the following weeks from 6.6% (Δ : -5.18 cm, CI95%: -8.03 cm to -2.33 cm, $p < 0.01$) to 17.0% (Δ : -14.57 cm, CI95%: -18.13 cm to -11.00 cm, $p < 0.01$) respectively. In contrast the CTRL group was not improved SLR performance ($p > 0.05$).

Figure 1. Graphical demonstration of the SLR Test results for the experimental groups (4 weeks)



Adjusted means \pm CI95%

PRE: indicates pre value as a covariate

*: $p < 0.01$, indicates significant difference from pre of the corresponding week

§: $p < 0.01$, indicates significant difference from CTRL of the corresponding week

†: $p < 0.01$, indicates significant difference from pre of week1

Discussion

To our knowledge, this is the first research that has evaluated the effect of IASTM applications (Ergon® IASTM Technique) on different parts of the superficial back myofascial line of the human body on the hamstrings flexibility. More specifically, this research aimed to examine whether there is a functional interface between the myofascial structures of the line which is likely to affect the functional capacity of anatomical structures that are remote from the point of the treatment.

The first significant finding of this research is that the application of Ergon® IASTM Technique is itself capable of inducing substantial gains in myofascial flexibility in the regions and joints applied. The therapeutic applications of Ergon® IASTM Technique once a week led to a statistically significant linear increase in myofascial flexibility of the posterior part of the body compared to the control group. These findings are in full agreement with the results of other investigations both for the Ergon® IASTM Technique^{5,6} and for other IASTM Techniques.^{8,9}

One of the innovations of the present research is that it assessed the cumulative effect of the Ergon® IASTM Technique application on flexibility adaptations over 4 weeks that reflects the length of time for a typical musculoskeletal rehabilitation program. Most of the studies in the past have examined the acute effects of IASTM applications which can be attributed mainly to neurophysiological factors and not to permanent adaptations. The results of the present study further strengthen this theory as it enhances the cumulative impact of the implementation of IASTM techniques on myofascial flexibility. It shows that even one treatment session per week when performed for 4 weeks can lead to a linear and sustained increase in flexibility for the period of therapeutic applications.

The second main finding of the present study and the most innovative one is that the application of Ergon® IASTM Technique on either the lower or upper part of the superficial back myofascial line elicit considerable increases of Hamstrings' flexibility irrespective of the site of application. The evaluation of the Hamstrings flexibility with the SLR test indicated that the exclusive application of the Ergon® IASTM Technique either to the trunk or to the lower extremity led to significant positive adaptations on the hamstrings flexibility which did not differ significantly between them. In other words, the application of techniques to upper parts of the superficial back line could result in positive adaptations to the lower parts of the superficial back line, i.e., in structures that are far from the point of Ergon® IASTM Technique application. These findings, although important and innovative, cannot be confirmed or questioned for their validity as there is no corresponding research to date. However, they are in complete agreement and are indirectly confirmed by surveys that evaluated the remote stretching application on the superficial back line presenting similar results.^{3,4} Wilk et al reported that that lower limb stretching based on myofascial chains can induce similar acute improvements in cervical ROM as local stretching.^{3,4}

Several theories can partly explain the underlying mechanism of remote IASTM treatment effects. One factor explaining non-local treatment reactions could consist in cortical adaptation processes and central pain-modulatory system. As different kinds of interventions (e.g., stretching or self-myofascial release) have been demonstrated to affect both the involved and the uninvolved limb,¹⁰ it might be argued that IASTM applications induce systemic responses like a reduced stretch tolerance. Another explanation may have a neurophysiological basis. Correctly, it has been reported¹¹ that the application of myofascial techniques can lead to local as well as general body relaxation and a decrease in myofascial tone, which may explain the findings of the present study. The findings of the present study can also be explained by the mechanical force transmission via connective tissue. In support of this theory, Carvalhais et al.,¹² have shown that fascial structures function to transfer strain to neighboring skeletal muscles.

Final results regarding the transmission of myofascial energy in the form of tissue relaxation and the increase of elasticity cannot be deduced from this research and under the weight of its limitations. Specifically, this study evaluated people with reduced flexibility rather than ordinary people in an attempt to make the results clinically meaningful. Despite its limitations, the clinical value of the findings of this research is particularly important. In particular, the present study shows some evidence that it may be sufficient to treat a part of a myofascial line such as the Superficial back line, to create significant functional adaptations in distant parts of the entire line. If other future studies confirm this finding, it will lead to significant modifications in physiotherapeutic protocols to prevent and rehabilitate major musculoskeletal pathologies and injuries such as low-back pain and hamstrings strains in athletes.

Conclusions

In conclusion, Ergon® IASTM treatment of either the upper or lower part of the superficial back line may lead to a significant increase in the hamstrings flexibility after four treatment sessions spread over four weeks. Impressively, applying IASTM techniques to distant points has led to the same improvement in the elasticity of some areas by applying a topical treatment to them. The above adaptations can be explained by the myofascial transmission of tension and relaxation and by the neurophysiological reduction of muscle tone. In any case, more research is needed to support such innovative findings that can significantly modify treatment strategies of preventing and rehabilitating musculoskeletal pathologies and injuries.

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