Topics in Integrative Health Care
an International Journal
ISSN 2158-4222

Research

The Effects of the Fascial Distortion Model on Chronic Hamstring Tightness

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Topics in Integrative Health Care 2014, Vol. 5(3) ID: 5.3004

Published on September 30, 2014

Objective: The aim of this study is to determine if a single treatment using The Fascial Distortion Model (FDM) significantly increases hamstring flexibility in patients with chronic hamstring tightness.

Methods: Thirty participants with current chronic hamstring tightness and no current history of lower extremity injury received treatment with the FDM on their hamstrings appropriate to the distortion presented. The sit-and-reach test was used before and after treatment to determine hamstring flexibility. Summary statistics were calculated, and pre and post hamstring flexibility scores are outlined.

Results: There was a significant difference from pre- to post-test (mean pre =40 cm, post= 47cm), representing a 15% increase in post treatment flexibility. All 30 participants increased their sit-and-reach scores following the application of FDM.

Conclusions: This study demonstrates that a single treatment with the FDM increased hamstring flexibility in a group of participants suffering from chronic hamstring tightness.

Introduction

Flexibility of a muscle is a key component of human movement and performance, and the hamstrings are a group of muscles that commonly lack flexibility.[1-3] Decreased hamstring flexibility can be a result of failure of proper warm up and pre activity conditioning.[4] A connection between in- line activities such as walking and running has also been linked to hamstring tightness and lack of flexibility.[4] Chronic hamstring inflexibility may increase the incidence of lower extremity overuse injuries and low back pain.[5] Other studies have shown that a decrease in hamstring flexibility can lead to injuries such as patella tendinopathy, hamstring strain injuries, and other signs of damaged hamstring muscles, especially in the athletic population.[6]

There are several manual therapy techniques that aim to relieve pain, increase hamstring flexibility and range of motion, as well as prevent injury. These techniques include but are not limited to; static stretching, ballistic stretching, Proprioceptive Neuromuscular Facilitation (PNF), and myofascial release techniques such as Graston and Active Release Technique (ART).[7-12] Manual therapy treatments

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are also used to increase circulation, stimulate the Golgi tendon organs and proprioceptors to detect stiffness, and activate the lengthening of the muscle tendon unit.[13,14] Myofascial release techniques such as these are often a very effective approach to treating shortened muscles and tendons.[15] The Fascial Distortion Model is a manual therapy based on an anatomical model developed by Stephen Typaldos DO, in which many musculoskeletal dysfunctions are thought to be the result of specific alterations of the body's fascia and fascial planes.[15]
Fascia consists of dense fibrous connective tissue that provides a continuous tissue network. Fascial therapies such as FDM are designed to affect mechanical properties of fascia to improve its ability to adapt to physical stress.[16]

This study looks at the Fascial Distortion Model (FDM) and its effectiveness in treating specific fascial distortions, which, left untreated, can lead to other conditions such as muscle tightness, connective tissue alteration, and possible further injury. The Fascial Distortion Model was developed by Typaldos in an attempt to approach treatment of musculoskeletal dysfunction with more of an anatomical approach.[15] The Fascial Distortion Model makes the dysfunction physical, meaning that it does not treat a diagnosis such as "tendinitis", rather it treats the anatomical fascial distortion involved.[15] This exemption of the traditional diagnoses is helpful in achieving more effective outcomes from treatment.[15]

The Fascial Distortion Model includes six fascial distortions originally identified by Typaldos.[15] Each of these has a characteristic clinical presentation and corresponding treatment approach, although these have not at this time been validated. The practitioner relies on the patients' postural and biomechanical presentation to select the treatment approach that is hypothesized to correct the distorted fascia. Theoretically, as soon as the correction is achieved, an immediate improvement in strength, mobility, and reduction of pain should be noticed.[15] In clinical settings, FDM distortions are usually addressed in four to six sessions of treatment. In this study, a single treatment of the FDM was used to gather preliminary information on whether any change in hamstring flexibility could be detected.

Methods

This was a preliminary study using a single group, pre-test/post-test design. We estimated that we would be able to recruit 30 participants within the study period of 6 weeks. During the data gathering and treatment procedures, one investigator oversaw participant check in procedures, obtained written informed consent, and health questionnaires. Another oversaw measuring procedures and two other investigators provided treatment.

Participants

Inclusion criteria included participant self-reporting the existence of hamstring tightness for longer than 3 months duration, and participant score lower than the 70th percentile for their age group on a sit and reach screening test (SR test). Inclusion criteria for the initial SR test measurements were obtained from the table in American College of Sports Medicine in 2005: men ages 20-29 had to score less than 50cm, men ages 30-39 had to score less than 47 cm as the cut off point for subjects to be able to proceed in the study. For women ages 20-29 the measurement was less than 55 cm and for women 30-39 years of age the measurement was 52 cm or less.[17]

Exclusion criteria included any self-reported past or present history of lower extremity injury, vascular disorders, pregnancy, and/or an inability to perform the sit-and-reach test due to physical limitations. All inclusion and exclusion criteria were compiled through a pre-test questionnaire. The institutional review board of Logan University approved this investigation. Following an explanation of the study and

FDM technique, informed consent was obtained.

Measurement procedures

The participants began by performing a pre-treatment measurement of the SR test. The SR test was chosen due to its reliability in measuring hamstring flexibility.[18, 19] Other studies have demonstrated SR test R values being consistently over .90, compared to goniometer hamstring flexibility R values ranging from .51 to .89. [20] The SR test in which a fingertips-to-tangent feet distance is measured is probably the most widely used lineal measures of flexibility.[21] SR tests are often used to measure hamstring muscle extensibility in large scale evaluation settings because of the simple procedures and minimal training required to perform the test.[22] Originally the SR test was chosen to be the preferred test for standard fitness tests, personal fitness tests, such as the President's Challenge, and health related fitness programs.[22] Additionally the SR is included in most of these fitness tests because it is believed that measuring and maintaining hamstring extensibility may prevent injuries such as chronic musculoskeletal dysfunction, low back injuries, postural deviations, gait limitations, and risk of falling.[23]

The participants were placed in a seated position with their legs fully extended and feet placed flat against the device. The measurement apparatus consisted of a metal box with an extension of a metal measuring stick on the superior portion of it. Participants were instructed to sit up as straight as possible, and while placing one hand on top of the other with third digits overlapping, each participant was then asked to approximate third digits over the sliding bar attached to extended measuring stick . The participants were asked to slowly bend through the waist, not the lumbar spine, and move the sliding bar far as possible and then to pause for measurement. The examiner refrained from providing any encouraging remarks or feedback during the SR test.

Three measurements in centimeters were taken, each at the furthest point that the sliding rift reached. The average of all three were calculated and recorded. Following the initial SR measurement, the participants were assigned to a treatment table where they were instructed by an examiner to demonstrate to them where they felt pain and/or tightness in their hamstring.

Treatment procedure

After the pretest measurements were taken, the specific treatment was determined by another researcher, following the protocols described by Typaldos.[15] The identified distortions were then treated with standard protocol as defined by the FDM. Specific pressures, hand contacts, and motions used for treatment correlate to the identified distortion .FDM treatment techniques are characterized by either a thumb or whole hand contact, usually with a precise, aggressive pressure. Immediately following the treatment, the participants repeated the functional screening test as well as the SR test as described previously.

Data analysis

Participants completed written informed consent prior to data collection. They then completed the prescreen questionnaire that determined inclusion/exclusion criteria. Once deemed eligible, their age and gender were recorded and they proceeded to the SR test and the measurements were recorded. The treating investigator recorded their main complaint, patient presentation, as well as which distortions were found and treated. All measurements were taken on site and all calculations were performed in real time on site. **Table 1** consists of participant ID, gender, age, distortions they presented with, and pre and post treatment individual values as well as the average and overall change.

Table 1. Mean values comparing the pre- and post-intervention scores of the Sit-and-Reach tests with associated distortions.

ID	Gender	Age	Pre-test mean*	Distortion	Post-test mean*	Pre- to Post-Change
42	M	24	35	CONT	42	6
22	M	23	44	CYL	45	1
23	M	48	21	CYL	31	10
28	M	25	32	CYL	39	8
31	F	26	48	CYL	52	4
34	M	33	48	CYL	51	2
38	F	24	38	CYL	46	8
39	F	24	54	CYL	63	9
43	F	24	33	CYL	40	6
37	M	29	29	CYL/FOLD	34	6
15	F	23	55	HTP	57	2
30	F	23	35	HTP	44	8
05	F	31	51	TB	64	13
07	M	30	37	TB	41	3
09	F	23	47	TB	58	11
13	M	25	43	TB	47	5
17	M	25	40	TB	43	3
18	F	26	34	TB	47	13
20	M	20	33	TB	44	11
24	F	24	42	TB	48	7
25	F	23	52	TB	57	5
29	F	26	49	TB	59	10
32	M	27	35	TB	43	8
33	F	27	37	TB	43	6
41	M	42	33	TB	37	4
08	F	23	52	TB/CONT	57	5
27	M	24	31	TB/CYL	36	5
35	M	26	32	TB/CYL	46	13
03	F	24	53	TB/CYL/HTP	60	7
11	F	25	29	TB/HTP	34	5
mean		**27**	**40**		**47**	**7**

*Average of 3 measurements

Results

Based on this study's inclusion and exclusion criteria, thirty participants aged 20-48 years qualified as subjects and successfully completed the pre and post treatment SR tests (mean age, 27). The average pre-treatment SR test score was 40 cm. The average post treatment SR test score was 47 cm. The mean SR test score increased 7 cm. This change represents a 15% average increase in length after respective FDM treatment of the presenting distortion.

The majority of the participants fell into the age group of 20-29. Of the 30 participants, only 4 participants were 30 or older (1 female, 3 males). Triggerband distortions were associated with the greatest change from pre to post treatment

measurements. Of the 30 participants, 18 presented with Triggerband distortions, 12 presented with Cylinder distortions, 3 presented with a HTP distortions, 1 participant presented with a Folding distortion, 2 presented with a Continuum distortions, and 0 participants presented with a Tectonic distortion.

Discussion

Several fields of manipulative therapy such as chiropractic, acupuncture, structural integration, and osteopathy have hypothesized for some time that fascia plays a key role in the mechanisms of pain and dysfunction.[24] Of all the different types of tissues and cells involved in musculoskeletal kinetics and dysfunction, fascia has received very little scientific attention. [24] Fascia itself is very complex, presenting in the human body in three dimensional, ever changing patterns that can only fully be appreciated in living tissue, and even now, its role in human health, disease, and dysfunction is uncertain.[25] In spite of that, fascia is likely a major, although poorly understood player, in musculoskeletal biomechanics and function.[24]

After analyzing the data corresponding to this study, we were able to determine that a single treatment with FDM has a positive effect on hamstring flexibility and surrounding soft tissue structures, regardless of which fascial distortions were indicated by the participant and treated. Without a comparison group is it difficult to say for sure or not if the differences in post treatment measurements were due to the treatment intervention, effects of hamstring stretching for the SR test measurements, or other common factors within the study. Other studies on fascia and its properties have suggested that the mechanical forces generated by manual therapies, such as FDM, may stimulate fascial mechanoreceptors, which may, in turn, trigger tonus changes in connected skeletal muscle fibers.[16]

Limitations

There were several limitations of this study. The sample size of thirty was small, and there were no differentiations in gender, age or athletic ability. There was also no placebo treatment or comparison group so there is no way to know if the results are due to the FDM treatment or other factors. In addition, we used a sample of convenience with no power calculation. Post-treatment SR scores were obtained immediately after treatment so it is unknown for how long the flexibility lasts or if a specific number of treatments with the FDM would achieve more permanent effects. A final limitation in this study is the failure to have one practitioner consistently providing the treatment.

This study indicated that treatment based on the FDM showed a 6.8 cm increase in SR test scores. A similar study by Barlow et al showed that a single massage treatment on the hamstring muscle group has no effect on the results of the SR test. [11, 26] A study by George et al using ART on the hamstrings showed comparable results to this study in that significant increases in hamstring flexibility post treatment were noted.[11]

Future studies on the effects of the FDM on hamstring tightness could be expanded to include larger participant recruitment with a placebo comparison group. Other future comparative studies may include massage, Basic technique hamstring release protocols, ART, or PNF. Future studies could also aim at comparing specific fascial distortions under the FDM and look at comparisons between distortions. More specific populations of participants could also be useful in determining the effect of the FDM on hamstring tightness, performance, and restricted flexibility issues. For example, a future study could be performed that examines the effect treatment with the FDM has on competitive sprinters with a history of hamstring pathology.

Acknowledgements

The authors would like to thank Martha Kaeser, MS, DC, Director of Assessment Center, and Cheryl Hawk, DC, PhD, CHES, Associate Vice President of Research and Health Policy, at Logan University for their guidance and support.

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