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Self-myofascial release therapy moderately influence electromyography of longissimus dorsi muscle in golfers

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Abstract

Study aim: The longissimus dorsi (LD) is often injured among golfers. Self-myofascial release (SMFR) therapy is a common injury prevention technique. The purpose of this research was to analyze the impact of SMFR therapy on LD bioelectrical activity among golfers.

Materials and methods: Thirty-one golf players (28 males, age = 35.8 ± 13.1 years, BMI = 25.1 ± 3.9 kg · m^{-2}, training experience = 8.2 ± 5.4 years) underwent SMFR by foam rolling of the LD 4 times for 30 seconds. We performed electromyography to measure bioelectrical activity of the thoracic and lumbar components of the LD at rest and during the golf swing. We applied the Mann-Whitney U test to compare activity before and after SMFR.

Results: Resting activity of the thoracic component of the LD did not differ significantly on left (U = 470.5–487.5, p = 0.89–0.93) and right (U = 454.0–470.0, p = 0.71–0.89) sides before and after SMFR. Similarly, activity of the lumbar component at rest did not differ for either left (U = 475.5–500.5, p = 0.78–0.95) or right (U = 457.5–491.0, p = 0.75–0.89) before and after SMFR. We observed the same pattern during the swing. Neither the thoracic left side (U = 549.5–576.5, p = 0.18–0.34) or right side (U = 593.5–606.5, p = 0.08–0.11) nor the lumbar left side (U = 515.5–533.0, p = 0.46–0.63) or right side (U = 532.5–542.0, p = 0.39–0.47) differed significantly before and after SMFR.

Conclusions: After SMFR, only a slight reduction in bioelectrical activity of the thoracic and lumbar parts of the LD was observed; all the changes were non-significant. Physiotherapists and physicians should reconsider the value of SMFR in golfers.

Keywords: Paraspinal muscles – Electromyography – Myofascial release therapy – Golf – Athletic injuries

Introduction

Golf is one of the most popular sports in the world, especially in the economically stable countries [16]. According to the National Golf Foundation, the number of players is estimated at over 45 million people in the US [30]. Due to the increasing popularity of this discipline, there is a problem with injuries affecting the musculoskeletal system among golfers [27]. There is a need for tailored therapies and treatment methods developed by researchers and applied by practitioners. One of the most common injuries in golfers, both amateurs and professionals, is back pain [31].

The longissimus dorsi muscle is one of the key postural muscles and is stratified into: (1) capitis (head part), (2) thoracis (thoracic part) and (3) lumborum (lumbar part) [17, 18]. Especially parts 2 and 3 are responsible for maintaining proper posture, as the paraspinal muscles [17]. Inappropriate functioning of postural muscles causes low back pain [17]. The biomechanics of the golf swing involve approximately 120 muscles [7, 8]. Maintaining proper posture is crucial for golfers, allowing for generation of power during the golf swing [23]. The golf swing procedure without correct posture, including the longissimus dorsi muscle, makes hitting the ball weaker, with lower power [29]. Moreover, the thoracic and lumbar elements of the longissimus dorsi muscle are most respon-

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sible for the biomechanics of the spine during the golf swing, which may result in their overload [8, 31].

The self-myofascial release (SMFR) technique is a form of massage, most often with the use of foam rolling [3, 11]. It is based on the concept of the fascia as a shapable structure with the ability to change its elasticity. It is an independent form of myofascial release that is used to reduce and eliminate disorders of the myofascial system [3, 11]. SMFR can reduce muscle tension [19]. Previous studies suggested that SMFR may also reduce the risk of injury, increase the range of motion, minimize risk of overload and facilitate maintaining proper posture [28]. All listed aspects are crucial for performance enhancement in golf [16].

Electromyography (EMG) is a method used to assess the bioelectrical activity of the muscle to evaluate movement biomechanics or diagnose pathology [15]. EMG can be used to assess muscle function, the sequence of activation, and the interaction of several muscles [15]. Surface EMG (sEMG) facilitates the assessment of muscle function by placing the electrodes on the skin surface over the evaluated area [5]. Thanks to the non-invasive nature of sEMG, which is based on the recording of muscle voltage using self-adhesive electrodes, it is widely used for medical and rehabilitation purposes [5]. The diverse applications of sEMG also include research areas such as sports diagnostics [5].

However, there are no studies that compare the bioelectrical activity of the longissimus dorsi muscle before and after SMFR, in particular foam rolling. Only a few studies have touched on the topic of EMG of the erector spinae muscle in golfers or the short-term effects of SMFR in athletes, generally [23]. The previous studies recommended enriching the analysis to include new muscles and techniques [23]. Based on those research perspectives, we decided to conduct an exploratory study on the bioelectric activity of the longissimus dorsi muscle in the thoracic and lumbar spine.

We hypothesize that SMFR in the form of foam rolling is an effective therapy to relax and reduce the bioelectrical activity of the longissimus dorsi during the golf swing and at rest. The purposes of our research were as follows: (1) to determine the differences in bioelectrical activity between the components and sides of the longissimus dorsi muscle and (2) to compare the bioelectrical activity of thoracic and lumbar components of the longissimus dorsi muscle before and after SMFR.

Materials and methods

Study design

This cross-sectional study was approved by the Bioethical Committee of the Medical University of Warsaw (approval no. AKBE/203). In particular, we followed the guidelines of the Declaration of Helsinki and STROBE Guidelines [26]. The participants were informed about the purposes and methodology of this study and gave written informed consent. Participants were amateur and professional golfers recruited from Golf Parks Poland in Warsaw and Sobienie Królewskie Golf Club & Country Club in Sobienie Jeziory (http://golf.sobieniekrolewskie.pl, accessed on 28th May).

Sampling method

Participants' recruitment process lasted from 6th April 2019 to 4th May 2019. Participants were invited from people who play golf at Golf Parks Poland in Warsaw and Sobienie Królewskie Golf Club & Country Club in Sobienie Jeziory based on the following inclusion and exclusion criteria. The athletes were included after meeting the selection criteria: (1) age 16–69 years, (2) usage of a right-handed golf club, (3) no health contraindications for foam rolling, (4) previous experience in golf training (determined as at least 2 times a week in the month previous to the conducted study). Health contraindications that disqualified the participants were as follows: (1) diagnosed discopathy, spondylolisthesis, or spondylolisthesis, (2) self-reported back pain in the examined area on the day of the examination, and (3) superficial sensory disorders in the examined area of the back.

Thirty-one individuals took part in the study, including 28 males and 3 females. Average age of the study group was 35.8 ± 13.1 years. The golfers stated that they had been practicing this sport for a period from 0.5 to 20 years, on average 8.2 years. The vast majority (n = 16, 51.6%) play golf more than 4 times per month. The most commonly reported striking patterns were the slice (a hit with unintentional rotation of the ball to the right) and the hook (a hit with unintentional rotation of the ball to the left), reported by 8 and 9 athletes, respectively. The average ball-hitting distance for participants was 138.4 ± 18.9 meters. Twenty-three (74.2%) golfers did not have previous experience with any kind of SMFR including foam rolling. However, the majority of them (n = 24, 77.4%) did not suffer from any musculoskeletal injury in the previous year. A precise description of the study population is presented in Table 1.

Participants' preparation protocol

Preparation of the area for electrode placement started with the removal of excess hair using an electric shaver. Then we disinfected and degreased the skin surface using Octenisept spray (Schulke Polska Sp. z o.o., Warsaw, Poland), and then the area was wiped with light pressure using dry, sterile gauze compresses. These procedures were intended to dry the skin and remove dead skin to reduce skin resistance.

Table 1. Characteristics of the study population

Baseline variable		Group			***p*-value**
		All [31, 100%]	Males [28, 90.3%]	Females [3, 9.7%]	
Age [years]		35.8 ± 13.1	35.9 ± 13.9	35.7 ± 8.4	0.98
Height [cm]		180.8 ± 7.3	182.1 ± 6.3	168.7 ± 5.9	<0.001
Weight [kg]		82.5 ± 16.6	85.0 ± 15.8	59.7 ± 3.1	0.01
BMI [kg · m^{-2}]		25.1 ± 3.9	25.1 ± 3.9	21.0 ± 0.8	0.06
Dominating hand	Right	30 (96.8%)	27	3	0.10
	Left	1 (3.2%)	1	0	
Training experience [years]		8.2 ± 5.4	8.9 ± 5.3	1.2 ± 0.8	0.02
Monthly training volume	1 session per month	5 (16.1%)	3	2	0.10
	2 sessions per month	5 (16.1%)	4	1	
	3 sessions per month	2 (6.5%)	2	0	
	4 sessions per month	3 (9.7%)	3	0	
	>4 sessions per month	16 (51.6%)	16	0	
Preferred type of golf shot	Slice	8 (25.7%)	7	1	0.005
	Hook	9 (29.0%)	8	1	
	Top	2 (6.5%)	2	0	
	Daff	2 (6.5%)	2	0	
	Push	3 (9.7%)	3	0	
	Pull	5 (16.1%)	5	0	
	Other	2 (6.5%)	1	1	

Categorical variables are presented as numbers (percentages) and differences were calculated from χ2 test or one-way ANOVA. Continuous variables are presented as mean ± standard deviation and differences were calculated from student t-test.

Each golfer was instructed to perform a standardized 10-minute warm-up consisting of active free exercises, stretching exercises, exercises increasing the range of motion and 20 golf swings at various levels. The electrodes were placed superficially on the skin according to SENIAM on the target places of the longissimus dorsi muscle [12].

Processing EMG data

We applied a 4-second measurement of muscle bioelectrical activity using the sEMG method at rest followed by a double 4-second measurement of muscle bioelectric activity using the same sEMG method during a golf swing. Then we removed the electrodes from the participant's body.

After that, we applied the auto-myofascial release of the examined area using a foam roller and we repeated a 4-second measurement of muscle bioelectric activity using the sEMG method at rest. Finally, we repeated a double 4-second measurement of muscle bioelectric activity using the same sEMG method during a golf swing.

We used the MyoSystem 1400L with Noraxon's dedicated MyoResearch software (MedWrench, Tyrone, GA, USA) to test the level of bioelectrical activity of the longissimus dorsi muscle in its thoracic and lumbar components. Four channels were used for recording the bioelectrical signal: the thoracic parts of the longissimus dorsi on the left side (ThL) and right side (ThR) and lumbar parts of the longissimus dorsi on the left side (LL) and right side (LR). Skintact F-261 (Leonhard Lang, Innsbruck, Tirol, Austria) electrodes were used on a polyethylene foam base with Aqua-Tac solid gel and an Ag/AgCl sensor (sensor's diameter of 20 mm). Electrodes were placed according to SENIAM and following the instructions of the manufacturer [12]. The electrodes were additionally attached to the skin by fabric adhesive to prevent them from peeling off during movement.

After placing the electrodes at appropriate points on the patient's body, the patient was recommended to stand still in a relaxed, resting position with the feet placed at shoulder-width, upper limbs loosely along the body, and looking straight ahead. In this position, a 4-second pass was made to measure the bioelectrical activity at rest.

After completing the resting measurement described above, the subject took a golf club (7 Iron) and performed one swing in a trial session with attached electrodes. After that, on a command, the athlete executed the proper golf swing. After 30 seconds, the measurement was repeated. For the record study, only the second result was entered to eliminate the learning effect. When removing the electrodes, we marked the place with a marker where they were attached to accurately reproduce the measurement protocol after foam rolling therapy.

All data were collected at 1000 Hz and were digitally filtered at 10-450 Hz. The data underwent *full wave rectification* and *smoothing* using the root mean square error.

Foam rolling procedures

Each participant was given a short instruction regarding the correct protocol to perform foam rolling using a smooth, hard Sissel foam roller (Sissel, Katowice, Poland). Foam rolling protocol in the thoracic and lumbar spine consisted of 4 repetitions of 30 seconds as recommended by Wiewelhove et al. [28]. Participants used a foam roller with medium density according to Cheatham et al. [6, 7]. The golfer was asked to lie on the floor in a supine position. The foam roller was placed between the ground and the back of the subject. The subject's upper limbs were bent at the shoulder joints and elbows with hands clasped behind the head. The head was kept in a straight line with the trunk. The lower limbs were bent at the knee and hip joints.

The participant had to perform foam rolling movements along the spine alternately in the cephalad and caudal directions, using flexion and extension movements of the lower limbs at a slow and steady pace.

After completing the therapy, the skin was cleansed, disinfected, and dried again using Octenisept spray (Schulke Polska Sp. z o.o., Warsaw, Poland). Then the electrodes were glued in the previously marked places, followed by a 4-second measurement at rest and double 4-second measurements during the golf swing, according to the same methodology as before the therapy.

Statistical analysis

The analysis began by checking the data distribution using the Shapiro-Wilk test. Continuous data were presented as mean ± standard deviation for parametric data and median (25^{th}–75^{th} quartile) for non-parametric data. Categorical data were presented as numbers (percentages). Differences between continuous demographic data (i.e. age, weight, height, BMI and training experience) were calculated from Student's t-test due to parametric distribution. Differences between categorical demographic data (i.e. dominating hand, training volume and type of golf shot) were calculated from the χ^2 test or one-way ANOVA. To test differences between the bioelectrical activity of the longissimus dorsi muscle we used the Mann-Whitney U test due to non-parametric distribution. The power of our population was evaluated post-hoc via G*Power Software (version 3.1.9.6) [10]. The achieved power was 0.86 with a large effect size ($d \geq 0.8$) for the Mann-Whitney U test at $\alpha = 0.05$ [24]. Therefore, the sample size supports the credibility of the obtained results.

The significance level of two-tailed $p < 0.05$ was adopted. All the analyses were performed in SPSS Statistics (version 29.0, IBM, Armonk, NY, United States) and GraphPad Prism (GraphPad Software, San Diego, CA, USA; version 10.2.2).

Results

Differences in longissimus dorsi muscle voltage before and after SMFR

In general, the voltages of the longissimus dorsi muscle were reduced after SMFR. However, all the changes were slight and did not reach statistical significance in any case. The most significant reduction occurred for peak voltages during the swing in ThR (U = 606.5, p = 0.08). The smallest impact of SMFR was in the LL for average voltage at rest (U = 475.5, p = 0.95). The exact voltages with their comparisons before and after therapy for all components of the longissimus dorsi muscle are presented in Table 2. Finally, we present the comparison of voltages before and after foam rolling in Figure 1.

Differences between sides and components of the longissimus dorsi muscle

We observed three significant differences between the sides or components of the longissimus dorsi muscle: (1) in peak voltage between ThR and ThL at rest before SMFR (U = 631.5, p = 0.03); (2) in peak voltage between ThR and ThL at rest after SMFR (U = 625.0, p = 0.04); and (3) in peak voltage between LR and LL at rest after SMFR (U = 627.0, p = 0.04). We did not see observe significant differences in any configuration when comparing the sides or components of the longissimus dorsi muscle. All the analyses are shown in Table 3. For exact values of voltages, see Table 2.

Discussion

Summary

We conducted a study on 31 golfers investigating the impact of SMFR therapy on bioelectrical activity of the longissimus dorsi muscle. In this study, we found that bioelectrical activity of the longissimus dorsi muscle was

Table 2. Analysis of voltages in Longissimus Dorsi muscle before and after therapy

Component of Longissimus Dorsi muscle	Average voltage before SMFR at rest [µV]	Average voltage after SMFR at rest [µV]	Mann-Whitney U	***p*-value**	Peak voltage before SMFR at rest [µV]	Peak voltage after SMFR at rest [µV]	Mann-Whitney U	*p*-value	Average voltage before SMFR during swing [µV]	Average voltage after SMFR during swing [µV]	Mann-Whitney U	*p*-value	Peak voltage before SMFR during swing [µV]	Peak voltage after SMFR during swing [µV]	Mann-Whitney U	***p*-value**
ThL	8.0 (6.3-9.4)	7.2 (6.2-11.3)	487.5	0.93	58.1 (43.3-68.7)	61.4 (45.9-70.8)	470.5	0.89	41.1 (34.2-55.9)	40.6 (29.5-49.5)	549.5	0.34	442.0 (351.0-781.0)	391.0 (290.5-634.0)	576.5	0.18
ThR	8.4 (7.0-12.1)	8.7 (6.4-12.7)	470.0	0.89	61.3 (50.0-79.2)	62.2 (51.2-81.2)	454.0	0.71	43.5 (34.6-61.3)	35.8 (28.8-52.9)	593.5	0.11	602.0 (398.5-883.5)	385.0 (314.5-596.5)	606.5	0.08
LL	7.1 (5.5-11.9)	7.5 (5.6-10.3)	475.5	0.95	41.2 (34.2-58.6)	41.4 (31.8-61.7)	500.5	0.78	45.9 (34.6-56.5)	40.0 (28.8-55.9)	515.5	0.63	577.0 (379.5-762.5)	446.0 (343.0-712.5)	533.0	0.46
LR	6.8 (5.8-10.4)	6.8 (5.4-11.9)	491.0	0.89	51.2 (38.4-63.4)	44.4 (38.3-75.5)	457.5	0.75	42.2 (34.3-55.4)	45.3 (34.6-53.0)	532.5	0.47	559.0 (383.0-707.0)	526.0 (319.0-701.5)	542.0	0.39

Abbreviations: SMFR – Self-Myofascial Release therapy; µV – microvolts; ThL – left side of the thoracic part of the Longissimus Dorsi muscle; ThR – right side of the thoracic part of the Longissimus Dorsi muscle; LL – left side of the lumbar part of the Longissimus Dorsi muscle; LR – right side of the lumbar part of the Longissimus Dorsi muscle. Data are presented as median (25^{th}–75^{th} quartile) due to non-parametric distribution.

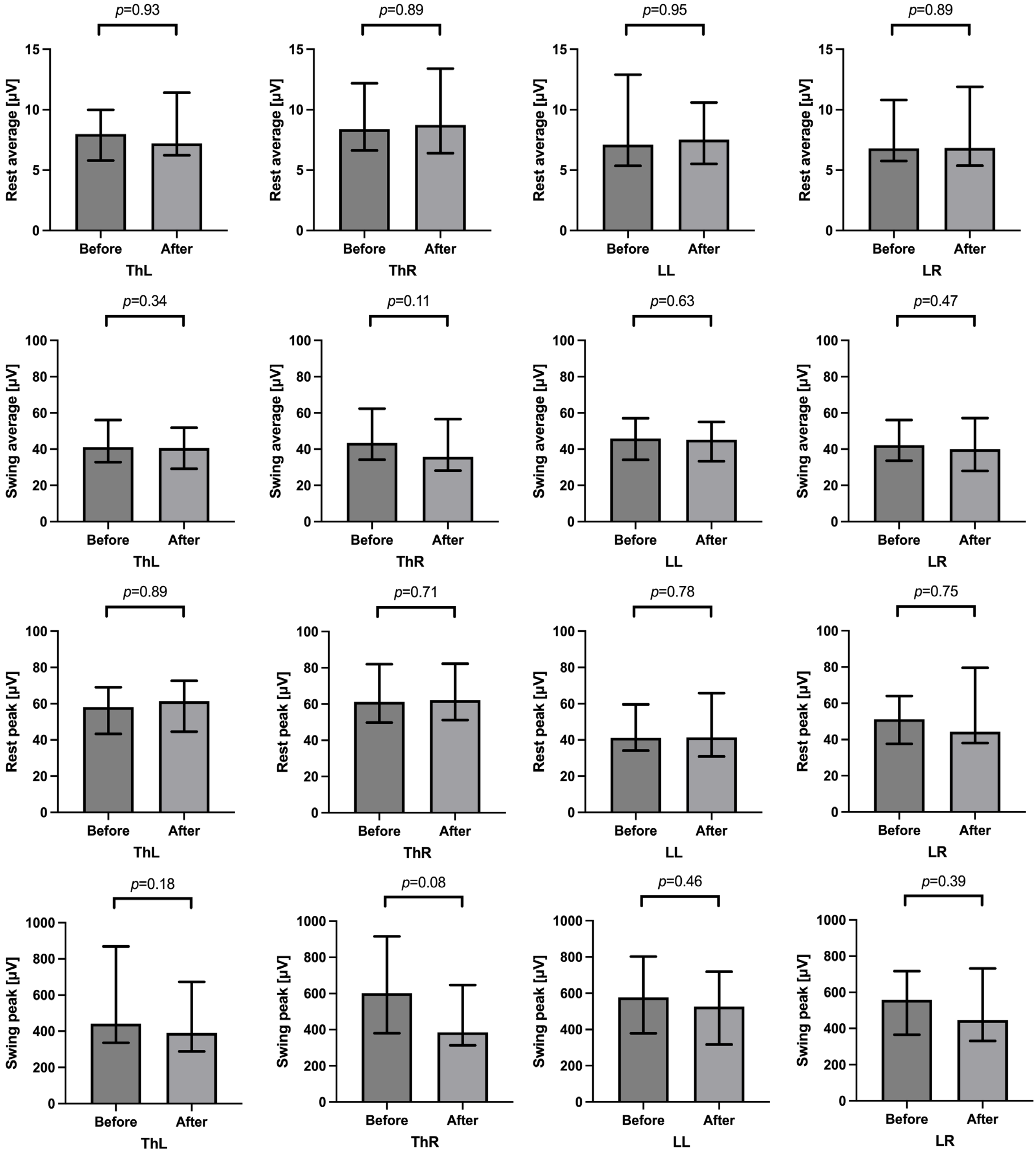

Fig. 1. Longissimus Dorsi muscle voltages before and after foam rolling therapy
Abbreviations: ThR, right side of the thoracic part of the Longissimus Dorsi muscle; ThL, left side of the thoracic part of the Longissimus Dorsi muscle; LR, right side of the lumbar part of the Longissimus Dorsi muscle; LL, left side of the lumbar part of the Longissimus Dorsi muscle. Data are presented as median, and the ranges represent the interquartile range (25^{th} to 75^{th} quartile).

minimally affected by the SMFR, both in thoracic and lumbar components. Moreover, the voltages of the longissimus muscle were stable and highly similar between sides and components, both at rest and during the golf swing.

We observed right-sided lateralization in the thoracic spine, but only at rest for the average values, and in the swing only for the peak values. We also recorded left-sided lateralization before the swing in the lumbar component of the longissimus dorsi muscle. Our findings

Table 3. Comparison of voltages in Longissimus Dorsi muscle between parts and sides

Compared muscle areas	Average		Peak	
	Mann-Whitney U	***p*-value**	Mann-Whitney U	***p*-value**
Differences between sides before SMFR				
ThR vs ThL at rest [μV]	553.5	0.31	548.5	0.34
ThR vs ThL during swing [μV]	520.5	0.58	527.0	0.52
LR vs LL at rest [μV]	455.0	0.73	554.0	0.30
LR vs LL during swing [μV]	451.0	0.68	472.5	0.92
Differences between sides after SMFR				
ThR vs ThL at rest [μV]	574.0	0.19	573.0	0.20
ThR vs ThL during swing [μV]	479.0	0.99	594.0	0.11
LR vs LL at rest [μV]	483.5	0.97	500.0	0.79
LR vs LL during swing [μV]	433.5	0.51	475.0	0.94
Differences between components before SMFR				
ThR vs LR at rest [μV]	616.0	0.06	631.5	0.03
ThR vs LR during swing [μV]	509.0	0.69	506.5	0.72
ThL vs LL at rest [μV]	506.5	0.12	350.0	0.07
ThL vs LL during swing [μV]	443.0	0.60	451.0	0.68
Differences between components after SMFR				
ThR vs LR at rest [μV]	609.0	0.07	625.0	0.04
ThR vs LR during swing [μV]	461.5	0.49	410.5	0.33
ThL vs LL at rest [μV]	530.5	0.80	627.0	0.04
ThL vs LL during swing [μV]	386.0	0.19	398.5	0.25

Abbreviations: SMFR, Self-Myofascial Release therapy; ThR, right side of the thoracic part of the Longissimus Dorsi muscle; ThL, left side of the thoracic part of the Longissimus Dorsi muscle; LR, right side of the lumbar part of the Longissimus Dorsi muscle; LL, left side of the lumbar part of the Longissimus Dorsi muscle. Significant p-values (<0.05) were bolded.

suggest that in the golf swing, the longissimus dorsi muscle is mostly loaded in the right thoracic and left lumbar parts. Right sided lateralization is probably related to the physiological phenomenon of scatter as muscle tension increases, which is manifested in an increased number of peaks during contraction [20, 25]. Comparably, left sided lateralization is related to the effect of excessive loading on this muscle, as no such lateralization was observed during rest. The biomechanics of the golf swing itself provide some explanation [8]. During the downswing, when the activity of the longissimus dorsi muscle is the highest, the direction of the generated force is diagonal to the left and down and is accompanied by rotation of the torso to the left [4, 8]. The longissimus dorsi muscle is responsible for stabilizing the spine and protecting the spine against injuries that may result from increased bending and twisting forces generated by abdominal oblique muscles [1]. Thus, the longissimus dorsi muscle in the thoracic and lumbar regions increases its activity to protect the spine more effectively [1].

We also observed interesting findings when analyzing the EMG records. A peak occurred at the beginning of each contraction before therapy and the following contraction was stable. After foam rolling therapy, the contraction was stable for the entire swing period. It may suggest better control over muscle contraction, more ergonomic contraction, or a reduction in reflex activity. Schleip and Müller suggest that SMFR therapy improves proprioceptive functions [21]. However, the impact of foam rolling on motor and coordination has not been fully confirmed yet. In the research of Freiwald et al., it was found that the short-term effects of foam rolling included increased muscle flexibility and range of motion [11]. Research by MacDonald et al. showed that foam rolling increased the height of the vertical jump in the period of 24 to 48 hours after therapy without increasing the induced contractile properties of the muscle [14].

In our study, we noted that the greatest bioelectrical activity occurred during the downswing. It is worth emphasizing the observations made by Sorbie et al., who used sEMG to examine the activation of the thoracic and lumbar parts of the erector spinae muscle during the golf swing using different clubs [23]. By video analysis synchronized with EMG, periods of activity were isolated for each swing phase. Sorbie et al. extended their analysis by measuring maximum voluntary isometric contraction and matched the corresponding values recorded during the swing [23]. The highest tension across all parts of the erector spinae muscle was also observed during the early, middle, and late stages of the downswing (called the acceleration subphase) [23]. Direct comparison of the research by Sorbie et al. to our work is limited due to different methodologies and evaluated muscles. However, a similar pattern of bioelectrical activity emerged in both studies.

Finally, the effect of foam rolling was negligible on the lumbar part and slightly more visible on the thoracic part. Perhaps, this is due to the heterogeneity of the foam rolling technique itself [14, 28]. However, the effectiveness of SMFR has not yet been proven and the conclusions are ambiguous [19]. Another explanation is that its effects occur mainly in the thoracic section due to the presence of ribs under the muscle. Due to the presence of ribs in the thoracic spine, the pressing force using bodyweight is stronger, which may translate into more visible SMFR results [6]. There are no ribs in the lumbar section, and pressing against them may increase the benefits of therapy. In the lumbar spine, the muscles may sink into deeper soft tissues under the pressure of the foam roller [28]. Another explanation could be more discomfort or pain during therapy applied to the lumbar spine, which may lead to stopping the massage too quickly or reflex contracting the muscles. The probable reduction in bioelectrical activity in the thoracic spine and, to a lesser extent, the lumbar spine resulted from increased blood flow in these areas, higher parasympathetic activity and improved self-perception of recovery [28]. The golf swing is a dynamic and tiring movement [4]. Considering the dynamic nature of the golf swing, foam rolling facilitates soft-tissue recovery due to the central and peripheral factors (e.g. muscle soreness) [28]. Furthermore, Pearcey et al. speculated on the biomechanical effects of SMFR [19]. Ultimately, there are many potential mechanisms by which SMFR may reduce muscle electrical activity. Our golfers may have modulated muscle spindles and reduced muscle spasm resulting from trigger points [2].

Limitations

The main limitation of the present study was the lack of video analysis synchronized with the EMG recording. Such video equipment would enable the stratification of individual swing phases during measurement. Another limitation was the lack of the possibility to examine a wider group of females due to the small number of them willing to take part in the study. Ultimately, the cross-sectional character of this study prevents us from assessing a causal relationship. Therefore, the results should be analyzed carefully and consider the provided limitations.

Practical implications

Some practical implications of this study should be acknowledged. Firstly, SMFR myofascial release affects mechanoreceptors and the extracellular matrix, which reduces tension, relaxes muscles, and ultimately increases the range of motion [3]. Further, it could lead to a reduction in the risk of injury and pain in the lower back. Improved range of motion also allows a wider swing to be made, which may result in an increase in club speed during the impact phase [4]. A more energetic hit led to a longer distance covered by the golf ball [4, 22]. Finally, it translates into improved sports performance of the golfer during competition [16]. Secondly, foam rolling is a relatively cheap and easily accessible method of therapy, so it can be used widely [13]. Thus, foam rolling could be introduced as part of a pre-start warm-up for every golfer.

Further study directions

The present study should be interpreted as an introduction to further assessment of the impact of SMFR therapy on the bioelectric activity of the longissimus dorsi muscle. The sample size should be increased in future research and additional measurements of maximum voluntary isometric contraction should be used. The new studies should be expanded to include video analysis synchronized with the EMG recording, and a second therapy or control group should be included. The results from the control group could be compared with the results of the experimental group using SMFR release therapy. Further research should also include an assessment of the increase in the range of motion resulting from this SMFR therapy and changes in club head speed during the impact.

Conclusions

Bioelectrical activity of the longissimus dorsi muscle is minimally reduced after SMFR foam-rolling therapy. SMFR did not result in a significant difference in the voltage of the longissimus dorsi muscle. Physiotherapists and physicians should reconsider the value of SMFR in golfers.

Conflict of interest: Authors state no conflict of interest.

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