EFFECTS OF FASCIA-SUIT ON OXYGEN UPTAKE DURING NORDIC WALKING EXERCISE

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BACKGROUND:

Fascia is a network of connective tissue membranes. A superficial fascia is located beneath the skin and is made up of collagen fibers and other elastic threads. It folds into a deep fascia that surrounds the muscles and membranes and eventually binds to the bones. (Luomala et al., 2014) Fascia functions as a proprioseptic organ that senses body movement and position (Stecco et al., 2011). A fascia-suit is a garment designed to affect the function of the fascia and thus to support the body's natural position and movement. This may enhance the sensation and increases awareness of body movement and position.

Fascia's action is also influenced by, for example, kinesiotaping, which has been used as an aid in physiotherapy to control joints and muscles, and to improve posture. Kinesiotaping has been found in some studies to improve the neuromuscular system performance (Rebolledo-Mendez et al. 2017), while in the others no effects were revealed (Boozari et al. 2017). The effects of various compression suits on performance and recovery have also been shown; for example, improvement in maximum power output has been reported (McMaster et al 2017). However, the effect of the fascia-suit on energy consumption is not currently known. Therefore, the aim of the present study was to examine if an incremental Nordic walking test with fascia-suit would lead to different oxygen uptake than performing the test in normal training outfit.

METHODS

11 healthy trained female subjects (mean ± SD, age 20.4±9.1 y, body height 166.6±7.2 cm, body mass 58.1 ± 7.8 kg, and fat 17.3 ± 4.8 %) participated in this study. All were engaged in a regular endurance activity. The local ethics committee approved the protocol. Subjects were fully informed of the purposes and risks of participating in this study and signed informed consent document prior to testing.

Subjects performed two maximal incremental Nordic walking exercise tests until exhaustion on a treadmill wearing a Fascia-suit or without Fascia-suit during exercise and recovery. Table 1 shows the testing protocol. The two tests were assigned in random order under a counter-balanced design, and were conducted at the same time of the day, at least 3 days apart. The subjects were asked to avoid vigorous activity 24 h before testing.

Table 1: Maximal incremental treadmill tests protocol

stage	Time (min)	Speed (km/h)	Angle (°)
1	0-3	6	1.6
2	3-6	6	2.9
3	6-9	6	4.2
4	9-12	6.5	4.7
5	12-15	6.5	6.0
6	15-18	6.5	7.1
7	18-21	7	7.4
8	21-24	7	8.5
9	24-27	7	9.6
10	27-30	7	10.6
11	30-33	7	11.7
12	33-36	7	12.8

Oxygen uptake (VO2) was continuously determined using the COSMED K5 system (COSMED srl, Rome, Italy). Fingertip blood samples of 20 µl were taken during exercise within 20 s of each exercise step, and post-exercise at minutes 1, 4, 7 and 10.The lactate concentration was determined by EKF Biosen C-Line Clinic system (EKF Diagnostics Holdings, Cardiff, UK). Immediately after each level, subjects were asked to provide a rating of their perceived exertion (RPE) using the Borg scale.

Paired t-tests were used to detect between-intervention (with vs. without Fasicia-suit) changes. All tests were two-tailed and a 5% probability level was considered significant.

RESULTS

No significant differences in time to exhaustion were observed between conditions with and without Fascia-suit (26.5 ± 4.2 vs. 26.5 ± 4.6 min).

The RPE was significantly lower with Fascia-suit at 15 min (Figure 1 RPE (mean ± SD)

measured during maximal incremental exerciseFigure 1; $P<0.05$).

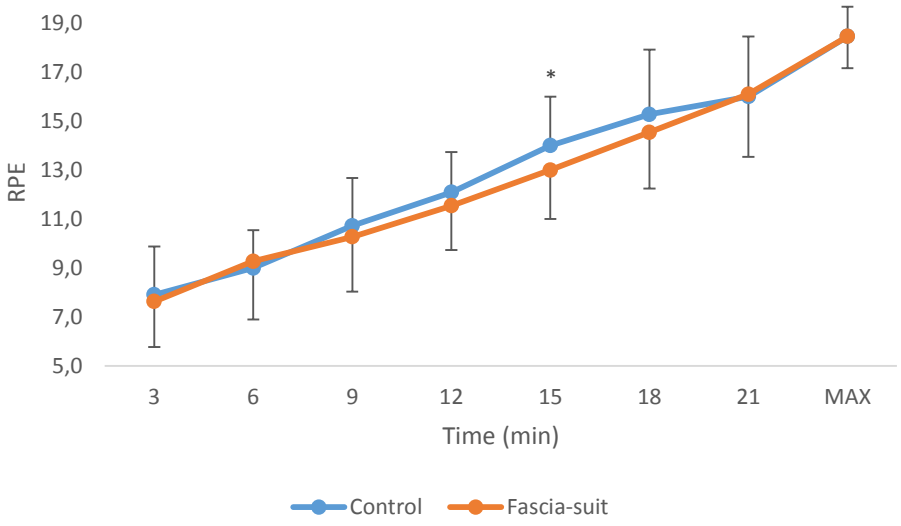

Figure 1 RPE (mean ± SD) measured during maximal incremental exercise

No significant differences in submaximal or maximal HR were observed between conditions with and without Fascia-suit (**Error! Reference source not found.**).

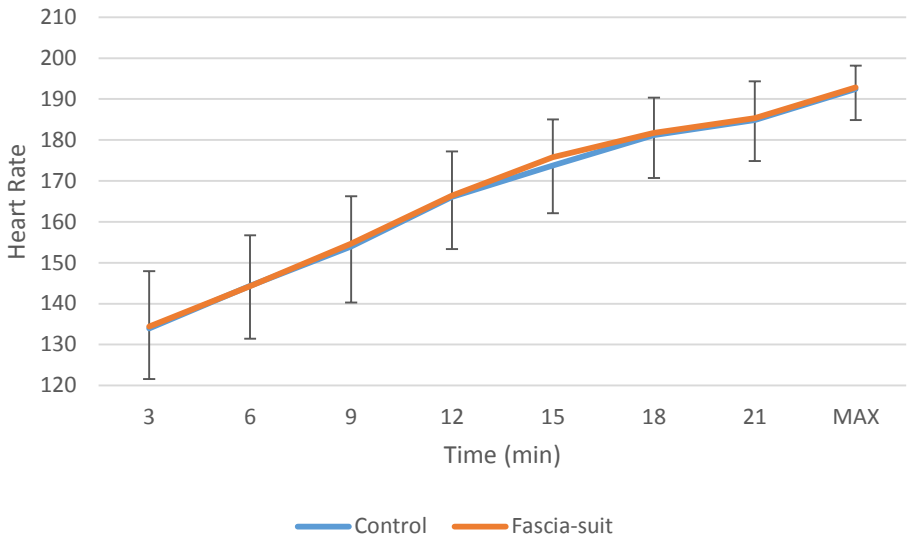

Figure 2 Heart rate (mean ± SD) measured during maximal incremental exercise

The Oxygen uptake was significantly higher with Fascia-suit at 6, 15 min and at the end of the maximal exercise (**Error! Reference source not found.**; $P<0.05$).

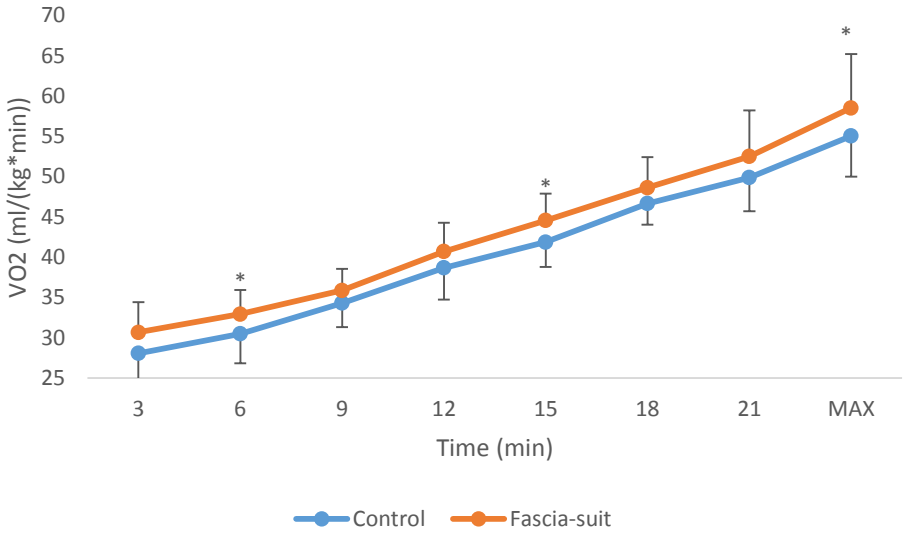

Figure 3 Oxygen uptake (mean ± SD) measured during maximal incremental exercise

Significantly higher blood lactate values were found at the end of the maximal exercise in Fascia-suit as compared to control (12.1 ± 3.8 vs. 9.8 ± 2.7 mmol/L, $P<0.05$). No significant differences in submaximal lactate were observed between conditions with and without Fascia-suit (Figure 4).

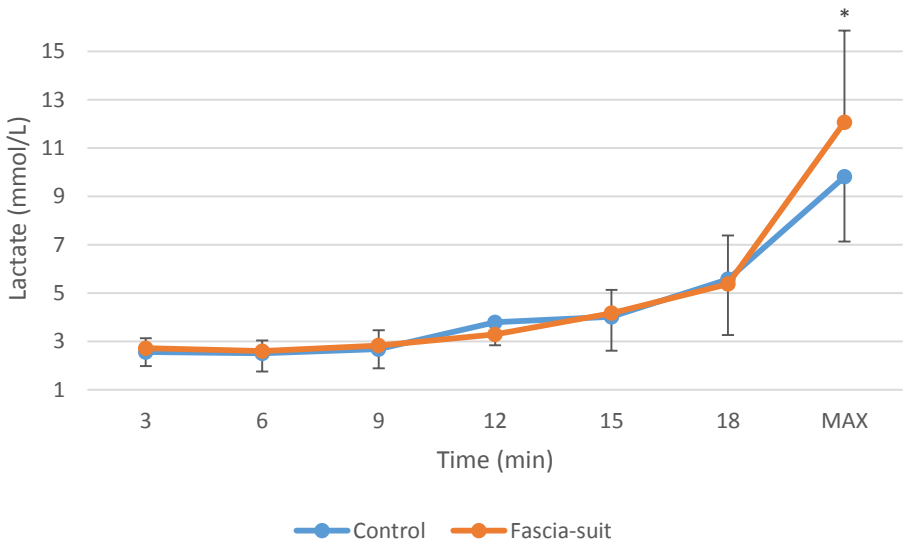

Figure 4 Blood lactate concentration (mean ± SD) measured during maximal incremental exercise

No significant differences in recovery lactate were observed between conditions with and without Fascia-suit (**Error! Reference source not found.**).

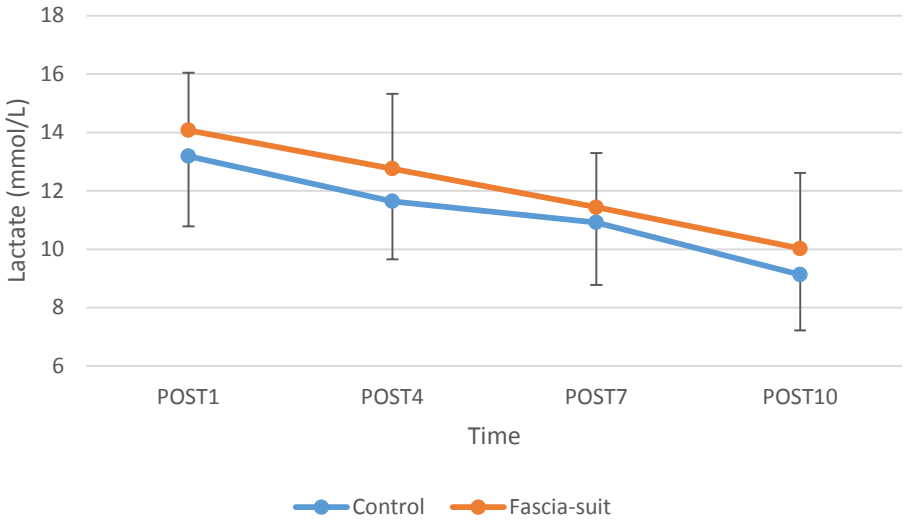

Figure 5 Blood lactate concentration (mean ± SD) measured during recovery

CONCLUSIONS

Wearing a Fascia-suit during maximal incremental exercise may lead to higher Oxygen uptake at submaximal levels. Thus, training with Fascia-suit may be metabolically more demanding as it leads to higher energy consumption with the same workload. Interestingly, higher energy consumption at submaximal levels did not, however, lead to shorter exhaustion time and RPE was actually lower at 15 min time point. This indicates that even though the exercise was more demanding, probably due to support from the suit, performing the exercise did not feel harder but rather even lighter. Higher Oxygen uptake and lactate at exhaustion may indicate that Fascia-suit can aid to improve the utilization of both aerobic and anaerobic energy production systems during high-intensity exercise.

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