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Why It is Important to Understand the Relation between Foam Rolling and Proprioception

Editorial

Amasay T*, David E

Department of Sport and Exercise Sciences, Barry University, Miami Shores, USA.

Foam rolling is a method used by professionals such as physical therapists, athletic trainers, and strength and conditioning coaches, as well as fitness enthusiasts to relieve tight muscles and/or to break down scar tissue. The foam roller's popularity has increased in recent years and can be found in variety of settings, such as gyms, clinics, and stores. It is believed to yield benefits similar to manual therapy/massage therapy, although it is not as specific as one on one massage therapy session. Foam rolling targets groups of muscles whereas, manual therapy can target specific muscle. It is the most cost-effective method to have in a group-training setting, which are common in the fields fitness and strength and conditioning. The foam roller has a cylindrical shape and is available in different sizes, textures, and foam densities. The different types of foam rollers assist in controlling the intensity of the intervention. Foam rollers are used frequently during warm up and cool down, as well as during practices, games, or exercise routines. Several studies investigated the influence of the foam roller on range of motion (ROM), delayed onset muscle soreness (DOMS), and even force and power output.

Most studies examining the effect of foam rolling on range of motion identified an increase in ROM. MacDonald et al. (2013) observed the effect of two 1-minute bouts of quadriceps foam rolling on knee joint ROM at two and 10 minutes post-intervention. Knee ROM significantly increased by more than 10% compared to baseline measurements [1]. Kelly and Beardsley (2016) observed the effect of three 30-second bouts of calf muscle foam rolling on ankle dorsiflexion ROM at zero, 5, 10, 15, and 20 minutes post-intervention. There was a significant increase in ankle dorsiflexion ROM compared to baseline for the dominant leg from zero to 20 minutes [2]. After a daily foam rolling intervention consisting of three 30-second bouts, Junker and Stöggl (2015) found that stand-and-reach test scores increased by three cm [3]. Mohr et al., (2014) investigated the acute effect of foam rolling, static stretching, and combined foam rolling and static stretching on passive hip flexion ROM. Subjects receiving the combined foam roll and static stretch treatment showed a greater immediate change in passive hip flexion ROM (24°) compared with static stretch alone (12°) [4].

Several studies have investigated the effect of foam rolling on DOMS. MacDonald, Button, Drinkwater, and Behm (2014) required subjects to perform a squat protocol to induce DOMS. Each subject completed 10 sets of 10 squats using a resistance of 60% of 1 RM. The foam rolling protocol consisted of two 60-second bouts that focused on the gluteus maximus and thigh muscles. Muscle soreness was assessed using the BS-11 Numerical Rating Scale (NRS) at 24, 48, and 72 hours post-intervention. After 24 hours, both the foam rolling group and the control group saw increases in soreness, although the foam rolling group experienced less soreness compared to the control group (543% and 714% increase over baseline, respectively). There were still large differences between groups at 48 hours (foam rolling group = 414%, control = 807%) and 72 hours (foam rolling group = 243%, control = 607%) [5]. Pearcey et al., (2015) used the same procedure to determine the effect of foam rolling on DOMS. Soreness was assessed using pressure-pain threshold, the minimum pressure applied to the muscles that causes pain. Higher thresholds indicated less muscle soreness. Foam rolling had a significant effect on pressure-pain threshold at 24 and 48 hours. At 24 hours, the pressure-pain threshold was 767.14 kPa for the experimental group, and 691.61 kPa for the control group. At 48 hours, the pressure-pain threshold was 758.31 kPa for the experimental group, and 650.4 kPa for the control group. They found no significant difference in pressure-pain threshold between conditions after 72 hours [6].

Most studies investigating changes in strength and power following foam rolling seem to indicate that foam rolling does not cause any significant change from baseline. MacDonald et al., (2014) found that 20 minutes of lower-extremity foam rolling had no significant impact upon maximal voluntary isometric contraction of the quadriceps, as measured by a strain gauge [5]. Healey et al., (2014) found that foam rolling of the quadriceps, hamstrings, calves, latissimus dorsi, and rhomboids for 30 seconds did not result in a significantly better isometric squat force. Moreover,

*Corresponding Author:
Tal Amasay,
Associate Professor, Department of Sport and Exercise Sciences, Barry University, 11300 NE 2nd AVE, Miami Shores, FL 33161, USA.
Tel: +305-899-3490
E-mail: tamasay@barry.edu

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foam rolling of the quadriceps, hamstrings, calves, latissimus dorsi, and rhomboids had no immediate effect on vertical jump power, or vertical jump height [7]. Nevertheless, there is still a lack in research examining the influence of foam rolling on the individual proprioception, which can influence performance and/or the prevalence of acute injury.

Proprioception contributes to body awareness by providing feedback to the central nervous system about the position of different body parts with respect to each other and the environment. Proprioception feedback encompasses the detection of muscular force and tension, and the sense of joint movement and position, which plays a significant role in balance control [8]. Although awareness of the external environment is very important in detecting potential threats and preventing injury, awareness of the body itself is just as imperative. Previous research identified a decrease in proprioception when the body is fatigued, which may increase the risk of injury [9]. Proprioceptive deficits have been shown to predict ankle injury risk [10]. As a result, there have been several studies investigating the effects of proprioceptive training programs to increase proprioception and limit injury [11, 12]. After implementing a proprioception training program, Riva et al., (2016) found an 81% reduction in the occurrence of ankle sprains [12], while another study by Eils et al., (2010) found a 35% reduction in ankle sprains [11]. Similar results were observed for the incidence of anterior cruciate ligament (ACL) tears. Mandelbaum et al., (2005) investigated the effects of a neuromuscular and proprioceptive training program on the incidence of ACL tears over two years. They found that after one year, the intervention group had a lower incidence rate of 1.9/1000 players, while the control group had a rate of 16.8/1000 players. Moreover, after two years of training the intervention group had a lower incidence rate of 4.74/1000 players, while the control group had an incidence rate of 18.3/1000 [13].

Although foam rolling may contribute to increased ROM, decreased DOMS, and may not influence force and power, further investigation is needed to understand the effects of foam rolling on proprioception. If foam rolling were to decrease proprioception, foam rolling prior to physical activity may lead to injury. However, if foam rolling were to increase proprioception, perhaps this improvement could assist in the prevention of acute injuries. More research is needed to develop specific guidelines for athletes and fitness enthusiasts regarding this intervention.

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