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## Summary

The effects of Foam-rolling exercises in therapy and sport are less investigated. There is no scientific evidence that Foam-rolling exercises can enhance warming-up procedures, blood flow, athletic performance, sensomotoric function, and coordination or reduce muscle and fascial connective tissue tone and stress-relaxation. In contrast, Foam-rolling exercises can improve flexibility (ROM) and delayed onset of muscular soreness (DOMS). However, more research to compare Foam-rolling exercises with traditional stretching and recovery treatments is required. During Foam-rolling exercises, a high mechanical load is inducted to the entire underlying tissue (e.g., fascia, muscular, nerve, vessel, and bone tissue). That external loads are 10-fold higher than the highest medical compression category 4 and exceed twice the pressure loads that are used in occlusion studies. To date, in regards to Foam-rolling exercises, there are no established and proven training methods overall. Future investigations to define fields of applications concerning Foam-rolling exercises in therapy, medicine, and sport are required. Therefore, in- and exclusion criteria as well as implementation of individualized Foam-rolling exercises are needed. In a further step, training principles and methods of Foam-rolling exercise including the use of different types of Foam-rollers according to different sports should be investigated and defined. Importantly, more research to investigate the underlying mechanical and physiological mechanisms of Foam-rolling exercises is strongly warranted. Overall, in regards to the observed minor scientific evidence with respect to athletic performance and underlying mechanical and physiological mechanism as well as the negligence of potential harmful effects in the scientific literature, Foam-rolling exercises should be used cautiously at this time.

**Keywords**
Foam-rolling– myofascial release– fascia– therapy– sport



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# Foam-rolling in sport and therapy – Potential benefits and risks

## Part 2 – Positive and adverse effects on athletic performance

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## Introduction

Foam-rolling exercises are a popular treatment with respect to different purposes in medicine and sport. Foam-rolling is performed on an individual basis through various types of massage roller (Fig. 1) [77]. In MedLine, the keyword "Foam-rolling" reveals 17 publications (01/24/2016). The first publication is dated back to 2013, but the existing numbers have continuously increased in the following years. This indicates both an overall poor scientific evidence and increased interest in Foam-rolling exercises.
With respect to the lack of scientific evidence existing in sport and therapy, Schroeder and Best [77] showed that the effects of Foam-rolling exercises as a pre-exercise or recovery strategy are neither homogeneous nor evident. McKenney et al. [54] included in their systematic review 10 publications and showed that the quality of the included studies was mixed and only few conclusions could be drawn. Moreover, the authors pointed out that more randomized controlled trials are needed. In a further systematic review, Beardsley and Skarabot [10] showed contradictory results of Foam-rolling exercises on flexibility, force-production, athletic performance, and delayed onset of muscle soreness.

## Foam-rolling – devices, exercises, and training principles

For the self-treatment of fascial connective tissue, different types of Foam-rollers are used (e.g., material, size) (Fig. 1). The Foam-rollers are intended to achieve a massage and/or stretch effect on the underlying tissue, especially for the fascial connective tissue. However, from the biomechanical point of view, it is not possible to solely influence the fascial connective tissue by external induced pressures [8,18,59].
The purposes of Foam-rolling exercises are manifold. Schleip and Muller [75] mentioned the following purposes:

- improving fascial remodeling;
- improving elastic recoil of fascial tissues;
- improving myofascial health;

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## Foam-rolling in Sport und Therapie - Potentieller Nutzen und Risiken

## Teil 2 - Positive und negative Effekte auf die athletische Leistungsfähigkeit


### Zusammenfassung

Die Wirkungen des Foam-Rolling sind sowohl im therapeutischen als auch im sportlichen Anwendungsfeld wenig untersucht. FOAM-Rolling zeigt keinen Einfluss auf das Aufwärmen, den Blutfluss, die Kraftfähigkeiten, die Sprungleistungen, die anaerobe Leistungsfähigkeit sowie die Sensomotorik (Koordination). Nach dem bisherigen Kenntnisstand können durch Foam-Rolling weder der Muskeltonus noch Stressfaktoren reduziert werden. Hinweise zur Wirksamkeit des Foam-Rolling gibt es im Bereich der Beweglichkeit, wobei die Effekte des Foam-Rolling nicht an die Wirkungen traditioneller Dehnmethoden heranreichen. Für die Bereiche der Regeneration nach sportlichen Belastungen sowie zur Schmerzreduktion bei Muskelkater gibt es erste Wirksamkeitsnachweise; vergleichende Studien mit tradierten Methoden zur Regeneration fehlen jedoch. Foam-Rolling übt auf das darunterliegende Gewebe (Faszien, Muskulatur, Nerven, Gefäße, Knochen) hohen Druck aus, der bis zum Zehnfachen der höchsten Kompressionsklasse 4 reicht und doppelt so hoch ist wie bei Studien mit kompletter Okklusion. Gegenwärtig existiert für das Foam-Rolling keine trainingswissenschaftlich und evidenzbasierte Trainingsmethodik. Zukünftige Untersuchungen müssen konkrete Zielsetzungen, Ein- und Ausschlusskriterien sowie die physiologischen Grundlagen des Foam-Rolling klären und festlegen. Ferner müssen Foam-Roller bezüglich ihrer Konstruktion an die individuellen Bedürfnisse in Sport und Therapie angepasst werden (z.B. Material, Durchmesser). Bevor diese Arbeiten nicht geleistet und die offenen Fragen nicht beantwortet sind, ist Foam-Rolling nur mit Vorsicht und unter Berücksichtigung potentieller Risiken anzuwenden, auf die in beiden Teilen des Reviews hingewiesen wird.


**Schlüsselwörter**
Foam-Rolling – Training – Faszien – Therapie – Physiotherapie

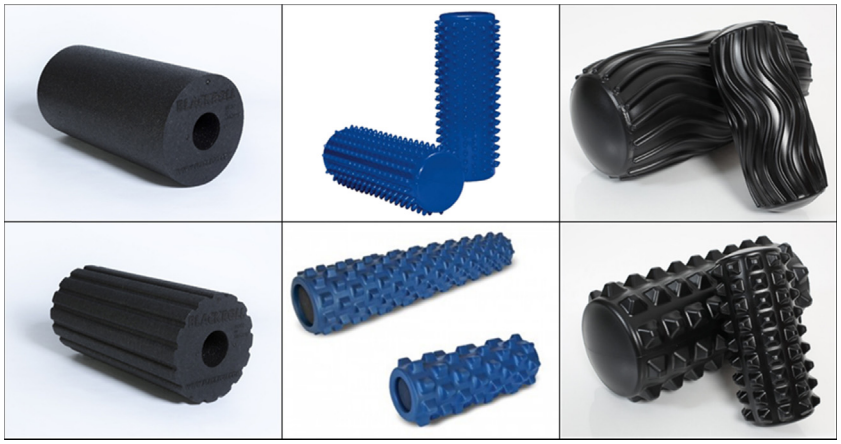

Figure 1
**Different types of foam-rollers (left – www.blackroll.de; center top – www.sport-thieme.de; center bottom – www.suprfit.de; right – www.togu.de).**

- improving fascial hydration and renewal;
- improving proprioceptive refinement.

## Fascial connective tissue – treatments

For many years, myofascial connective tissue complaints were treated by methods like massage, osteopathy, and physiotherapy and are supposed to reduce thickening, adhesion, and tension of muscle and fascia tissue [17,54,58].

Furthermore, it is generally recommended to perform special physical exercises, potentially helping to maintain fascial connective tissue "health" that are referred as "Fascial Fitness" (Figs. 2 and 3) [4,10,54,71,75,77,78,81].

## Foam-rolling – expected effects and state of research

Foam-rolling exercises are used for the treatment of myofascial pain in both preventive and rehabilitative

Figure 2
**Foam-rolling exercise on the anterior tight.**