

RUNNING SPORTS INJURIES

Dominance of overuse-related conditions

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Sabrina Mockenhaupt is one of Germany's most successful long-distance runners. Originally, she had intended to take part in the marathon at the London Olympic Games. But a fatigue fracture in the foot thwarted her plans and made her opt for the 10,000-m-race instead.

Running is becoming increasingly popular. The number of finishers at marathon events across Germany during the last three years – e.g. 36,542 finishers at the 2013 BMW Berlin Marathon – confirms this trend (Table 1). But what are the most frequent injuries in running sports and which conservative therapy options are there to treat them?



Diagnostik

LAUFSPORTVERLETZUNGEN

Dominanz von Überlastungsschäden

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Sabrina Mockenhaupt gehört zu Deutschlands erfolgreichsten Langstreckenläuferinnen. Eigentlich wollte sie bei den Olympischen Spielen von London im Marathon starten. Ein Ermüdungsbruch im Fuß machte ihr jedoch einen Strich durch die Rechnung und so schwenkte sie auf die 10.000 Meter um.

Laufen erfreut sich wachsender Beliebtheit. Dies belegen u. a. die Finisherzahlen für die deutschen Marathonveranstaltungen in den letzten drei Jahren mit beispielsweise 36.542 Finishern beim BMW Berlin-Marathon 2013 (Tabelle 1). Doch welche Verletzungen überwiegen im Laufsport eigentlich und wie sehen konservative Therapieoptionen aus?

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Marathon training

When taking up running with the intention of completing a marathon successfully, regular training over 18 to 24 months is vital to get the musculoskeletal system used to the physical demands. In the twelve-weeks' run-up to a marathon, a total weekly distance of about 60 kilometres is a rough indication for a targeted finishing time of four hours, for example. Here, training variation is the key, which means athletes should train at variable pace and run different distances. Two to three long runs of up to 30 kilometres at low speed are recommended in the run-up to a marathon. Running speeds as well as maximal oxygen uptake (VO₂ max) can be improved especially by interval training routines.

Besides acute injuries such as ankle joint distortion, overuse injuries of the musculoskeletal system are the most common conditions in running sports. Especially during periods of increased mileage and/or intensity, tendon injuries caused by overuse may occur. Higher running speeds seem to have a greater impact on the development of tendon overuse conditions than the weekly mileage alone, for instance. Monotonous training wearing the same running shoes and running on the same surface all the time may trigger stress reactions in the bone, e.g. in the metatarsus, and even cause stress fractures. The choice of shoes may have a positive or negative influence on certain overuse conditions. So in the treatment of runners, doctors and healthcare professionals require details about the training intensity and mileage, training variation, finishing times in competitions, the surface quality of the training track and the quality of the running shoes, as this information provides valuable insights into the nature of running injuries.



Frequency of running injuries

In a study of 291 runners (Foot Ankle Int 2008;29:671-6) with a mean age of 42 years running an average of 65 kilometres per week, we investigated the rate of running-related acute conditions and overuse injuries. The calculated total distance run by the participating subjects was 9,980,852 km. The gait analysis revealed that the most frequent overuse injuries in runners are Achilles tendon problems, followed by hamstring pain, shin splint and plantar fasciitis. When expressed in terms of the number of kilometres run, Achilles tendon problems arise after 62,772 km and hamstring pain – i.e. patellar tendinitis (runner's knee) – after 73,992 km. In subjects

suffering from Achilles tendon pain, disorders localized at two to six centimetres above the heel are about twice as frequent as close-to-heel conditions near the tendon insertion. Interestingly, running on asphalt rather than on forest trails reduces the risk of developing Achilles tendon problems by 50%, whereas running on sand increases this risk tenfold.

Achilles tendon injuries and other tendon problems

Achilles tendon problems are the most frequent overuse injuries in runners, followed by patellar tendinitis, plantar fasciitis and tibial stress syndrome (shin splint). Athletes suffering from Achilles tendon disorders typically report symptoms such as early morning stiffness, awkward gait and stress-dependent pain. Especially men over 35 years of age are most frequently affected by these symptoms. In many cases, athletes had intensified their training regimen performing interval training on the track, for example, or had done speed endurance runs before the injury occurred. Diagnostically, neovessels that are indicative of an inflammatory process can be detected by power Doppler sonography in cases of spindle-shaped thickening of the Achilles tendon and close-to-heel pain syndromes. The higher the number of neovessels, the greater the pain caused by associated CGRP and substance P positive neurons.

Early therapeutic intervention can provide a lasting improvement of these problems, which, if not treated, frequently become chronic. Based on EBM criteria, convincing studies have been conducted that corroborate the effectiveness of eccentric training to improve Achilles tendon disorders, plantar fasciitis and patellar tendinitis. In fact, randomized studies have confirmed that the pain associated with Achilles tendon problems can be reduced by 50% within twelve weeks by daily eccentric strength training on a step of a staircase, performing 15 repetitions per leg at least six times a day. Adjuvant proprioceptive training – as included in the core exercises for runners, for example – at least five minutes per day and leg can help reduce the pain still further. A randomized study conducted in Sweden revealed that sports activity up to pain level 5 on a VAS from 0 to 10 in combination with eccentric strength training is more beneficial than abstaining from running for three months, performing eccentric strength training alone, which means that running with moderate to bearable pain is unobjectionable. Kinesiology tapes applied specifically over the trigger points in the lateral and medial-lateral margins of the gastrocnemius muscle can help reduce the increased muscle tension and thus alleviate Achilles tendon strain. The same effects can be achieved for the patellar tendon.

As far as equipment-based treatment modalities are concerned, randomized studies have confirmed successful results of shock wave therapy and low-level laser therapy performed in combination with eccentric strength training, especially for Achilles tendon problems. Shock wave therapy can be performed using radial or focused shock waves – the latter being the author's preferred modality. Especially in the treatment of close-to-heel conditions with osseous manifestations of the periosteum, focused shock wave therapy can help achieve a targeted improvement of symptoms without any side effects. As confirmed by randomized studies, power Doppler guided sclerosing polidocanol injections also give successful results in the treatment of Achilles tendon and patellar tendon disorders. However, this specialist technique must be performed by experts only to exclude side effects. Cortisone injections into or close to the tendon alleviate pain for up to four weeks. However, beyond that period they are no more effective than placebo. This has been established – among other studies – by a metaanalysis published in *The Lancet*. Moreover, cortisone injections into the tendon region increase the risk of rupture.

Shin splint

The periosteal irritation associated with the tibial stress syndrome (shin splint) often causes extreme pain. Shin splints should be discriminated from tibial stress fractures by magnetic resonance imaging, for example. Risk factors have been established to include female gender, little running

experience, previous use of orthoses, increased BMI and previous shin splint injuries (Newman et al. *Open Access J Sports Med* 2013). A recently published British study of 450 British Army recruits investigated the effects of neuromuscular training on the development of shin splints (Sharma et al. *MSSE* 2014), demonstrating that the risk of shin splints could be durably reduced by 75%.

In addition to the RICE method (rest – ice – compression – elevation), kinesiology tapes and running shoes with adequate damping properties are useful and simple measures to complement the aforementioned proprioceptive training that is part of the core exercises for runners. As demonstrated in a controlled study, focused shock wave therapy can significantly alleviate pain after five therapy sessions compared to a control group and accelerate the athlete's return to painless high-speed running for 18 minutes (60 vs. 92 days, Moen et al. *BJSM* 2012).

Conclusion

Overuse-related conditions are the dominant problems among running injuries. Gradual training progression with a slow increase in intensity and wearing suitable running shoes can help reduce a number of adaptation problems. The majority of the partly innovative conservative therapy options outlined in this article are able to provide a targeted improvement in overuse injuries in runners.

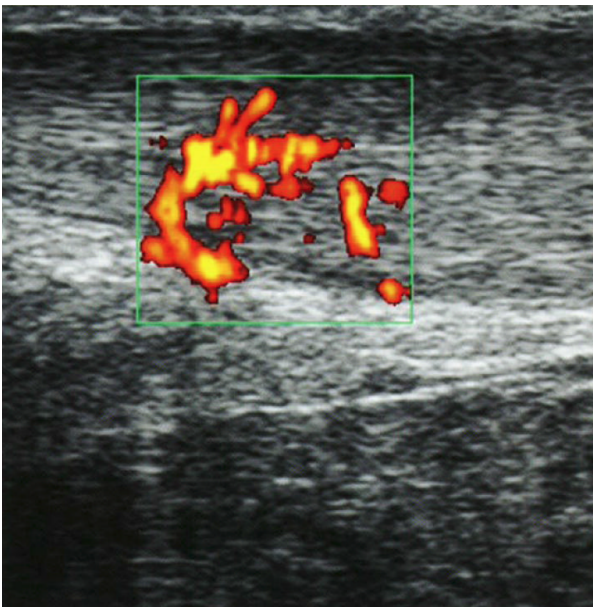


Fig. 1: Painful thickened Achilles tendon with neovessels in the mid-portion

Photo: © picture alliance / Gladys Chai von der Laage

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Table 1: Marathon finishers 2013
(Source: www.marathon-ergebnis.de)

	Finishers 2011	Finishers 2012	Finishers 2013
BMW Berlin Marathon	32,982	34,347	36,542
Haspa Marathon Hamburg	11,167	10,317	11,449
BMW Frankfurt Marathon	12,435	11,964	11,009
Munich Marathon	4,766	6,097	6,463
Cologne Marathon	5,484	4,814	5,129