SUBJECT:

The Deleterious Effects of Chronic Impact from Running

With recreational running at an all-time high in the United States, more people are regularly exercising and improving their fitness levels. The number of U.S. race finishers has increased nearly 600 percent since 1990, and the total number of annual U.S. running events has reached a record 28,200.[1]
A corresponding increase in injuries has accompanied this significant jump in running participation.

In fact, research estimates that approximately 74% of runners suffer a moderate or severe injury each year.[2] Some estimates are as high as 82% of runners will get injured at some point in their running career. And dedicated distance runners can attest to a myriad of acute and chronic injuries over time.

While running confers a host of physiological and psychological benefits, the repetitive stress it inflicts on the body over time can lead to injuries.

Impact Force and the Human Body

Science indicates that one of the most important types of stress, with regards to its impact on the human body, is impact force.[3] This is defined as a force resulting from the collision of two bodies over a relatively short time period.[4] During running, impact forces typically vary in magnitude from approximately 1.5 to 5 body weights.[5]

Stress on the body is not necessarily damaging, however, as bones, muscles, tendons and ligaments adapt positively to repeated applied stresses, provided that they are less than the tension limit with an adequate time period between stress applications.[6] Where injuries arise is with repeated stresses beyond the tensile limit with insufficient rest time between stress applications.[7] This can be what dedicated runners face during race preparation or with a regular rigorous training program.

Running subjects the body to external forces that include air resistance, gravity and ground reaction forces (GRFs).[8] Impact forces are affected by the body's center of mass and velocity at contact, the area of contact and the material properties of elements such as shoes and contact surface.[9] Faster running produces greater GRFs and higher stress on the bones, joints, muscles and tendons.[10]

Overuse injuries are caused by training, anatomical and biomechanical factors;[11] training variables include running frequency, duration, distance and speed.[12]

Although definitions vary, a running injury is "a musculoskeletal ailment that is attributed to running that causes a restriction of running speed, distance, duration or frequency for at least one week."[13]

Runners sustain acute injuries, such as fractures or ankle sprains, but most running injuries are a result of overuse – "resulting from the combined fatigue effect over a period of time beyond the capabilities of the structure that has been stressed."[14]

Common Overuse Injuries in Runners

It has been reported that about 50-75% of all running injuries are overuse injuries due to the constant repetition of the same movement.[15] The top five running injuries are:[16]

1. **Iliotibial Band Syndrome (ITBS)** – occurs when there is repetitive friction of the iliotibial band, causing burning pain in the outside of the kneecap
2. **Piriformis Syndrome** – irritation of this deep hip muscle can cause hip and buttock pain, and tightness in the piriformis results in pain that runs down the leg
3. **Patellofemoral Stress Syndrome** – improper tracking of the knee cap in the groove of the femur leads to knee pain
4. **Shin Splints** – inflammation of the anterior tibialis muscle
5. **Plantar Fasciitis** – irritation of the plantar fascia band of tissue on the bottom of the foot causes heel pain

One large-scale study shows that women more often suffered from ITBS, patellofemoral pain and hip or shin injuries; whereas injuries to the patellar and Achilles tendons were more common in men.[17]

Most of these injuries are treated with rest, ice, heat, anti-inflammatories, stretches and strength training. In some cases, an evaluation by a physician or physical therapist is recommended to provide personalized recovery and rehabilitation. Runners also make use of chiropractors, acupuncturists and massage therapists to help manage pain from overuse injuries.

However, epidemiological studies show that running injuries lead to a reduction in training or cessation of training in about 30% to 90% of all injuries.[18]

Ultimately, then, is there a smarter way to train that challenges the body and improves performance – without inflicting the damaging consequences of repeated stress on the body?

Zero-Impact Running

Logically, if repetitive impact is causing injury, removing some (or all) of these consistent forces should help reduce the occurrence or severity of overuse injuries. This leaves runners with options such as treadmills, underwater running, using an anti-gravity treadmill that unweights a percentage of one's body weight, elliptical machines and other modalities that aren't as similar to running, such as cycling, swimming and stairclimbing.

Dedicated runners tend to bristle at any other form of exercise than running, most likely because they don't closely replicate the motion and feel of running. Many would often rather work through pain logging miles than subject themselves to what they perceive as unproductive time on a cardio machine.

But now, for the first time ever, runners can replicate their natural running motion without any impact with the Zero Runner. Unique hip and knee joints on the machine 's independent pedals enable runners to use their natural stride and pace while supported throughout their entire gait.

An independent study by the University of Minnesota found that the Zero Runner had minimal force impact when compared to outside and treadmill running.[19]

Totally different from a treadmill that still delivers significant impact and requires users to keep pace with a moving belt, the Zero Runner helps runners engage their glutes and hamstrings during the pull-through and the lift phases, which can combat quadriceps dominance that commonly afflicts outdoor runners.

Runners also can monitor their stride health on the Zero, which measures gait length. As runners fatigue, their form typically is compromised, their gait may shorten and impact can increase. Rather than continually putting in junk miles when overtrained or fatigued, runners can preserve their form, reduce risk of overuse injury and still get in mileage on the Zero Runner.

Consider a runner who runs 30 miles/week, which is 1560 miles/year. If that runner uses the Zero Runner for just 30% of his training, he saves 468 miles of impact each year. Approximately every three years, this amounts to an "extra" year of running. By training without impact, runners are less likely to be sidelined and are able to extend their running career.

Conclusion

The injurious effects of chronic impact forces on dedicated runners are well-documented; therefore eliminating impact while retaining the same natural stride and muscle use on the Zero Runner is a significantly beneficial way to supplement outdoor training.

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