American Academy of Podiatric Sports Medicine

Advising Your Patients about Barefoot Running

What should you tell patients when they ask?

By David W. Jenkins, DPM

Introduction

One of the primary topics for requests for information by the media from the American Podiatric Medical Association and the American Academy of Podiatric Sports Medicine is barefoot running. To better deal with the numerous media queries, APMA and AAPSM developed a position statement on barefoot running that concludes, "Currently, inconclusive scientific research has been conducted regarding the benefits and/or risks of barefoot running."[1] As will be noted later, this statement is true but does little to help those clinicians unsure of how to best counsel their patients.

What follows is a summary of what has been learned about barefoot running thus far and is an attempt to cut through the claims, both positive and negative, in order to assist the clinician in advising patients.

Barefoot Running: The Hype

Barefoot running is not new. Besides the obvious ancient unshod ancestors, barefoot running was showcased with the 1960 Olympic marathon victory by Abebe Bikila, as well as world class performances by Herb Elliot, Bruce Tulloh, and Zola Budd over the ensuing years. Indeed, the author participated in weekly barefoot running sessions as part of track practice in the late 1960s. More recently, however, there is a significant interest in barefoot running which appears motivated by claims of improved performance and reduced injuries.

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The Claims

It seems much of the impetus for the current excitement stems from the current bestselling book by Christopher McDougall, *Born To Run, A Hidden Tribe, Superathletes and the Greatest Race the World Has Never Seen*[2] that details the exploits of the Tarahumara Indians of the Copper Canyon of Mexico. These runners regularly cover ultramarathon distances, either barefoot or in simple sandals. McDougall observes that the Tarahumara, despite their huge running mileage, do not appear to suffer from the high degree of running-related injuries that those in the civilized world do. Coupling this with an unchanged injury rate, despite decades of technological improvements in running shoes with regard to motion control and cushioning, he makes the claim that shoes are the *cause* of many running-related injuries. McDougall and early work by researcher Steven Robbins in the 1990s,[3,4] claimed that shoes: 1) confine and limit foot motion which results in intrinsic musculature wasting; 2) mask the proprioceptive

FIGURE 1: Barefoot runner

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interaction of the foot to the ground; and 3) encourage an unnatural heel strike that increases damaging impact forces. These ideas have been further echoed by popular barefoot running web sites such as *Running Barefoot* and *Barefoot Ted's Adventures*. These sites are packed with "how to" information, FAQs and links to studies that appear to support the claims of barefoot running advocates.[5,6]

The Benefits

Before looking at the evidence, what are the purported benefits? Though not necessarily a *benefit*, profound and undeniable differences are observed in the gait of the barefoot versus the shod runner, and these are said to be responsible for some of the stated advantages. Barefoot runners have a shorter and quicker stride and will experience less overall ankle, knee, and hip motion. The ankle will be plantarflexed and foot strike will be mid-foot or forefoot (Figure 1). Both flight and contact time will be reduced.[7] Listed below are the most notable claims of barefoot running advocates.

1) Reduced collision (impact) forces

2) Improved proprioception

3) Stronger plantar intrinsic musculature

4) Improved energy utilization

Claims 1-4 are then said to result in reduced injuries and better performance. An often-mentioned example is that those with better proprioception would surely experience fewer ankle sprains. Additionally, the stronger plantar intrinsics and absence of confining shoes are said to lessen the risk of foot deformities such as pes planus.

The Risks and Contraindications

Nearly all of the downsides of barefoot running come anecdotally from the healthcare provider community fueled by numerous episodes of patients who hobble in with injuries sustained while barefoot running. A number of these clinicians consider barefoot running silly and/or dangerous. Besides the major concern that an uncushioned foot will be subject to osseous damage such as stress fracture, listed below are some of the other concerns.

1) Surface hazards such as glass, rocks, insects, and temperature extremes

2) Contact with microorganisms and infectious agents

3) Runners with lack of protective sensation

4) Runners who require motion control shoes and/or orthotics

5) Increased impact at foot strike

6) Achilles and/or triceps surae injury from forefoot strike

The Evidence-Pro

There is little doubt that barefoot runners have a distinctly different gait than shod runners. Reduced impact with forefoot strike appears to reduce collision forces.[7-9] Numerous studies in the lab under static (not running) conditions do demonstrate improved proprioceptive ability in those who are barefoot and that improved foot position sense may assist in the observed gait changes responsible for reduced impact.[10-12] Limited studies do support the idea that the barefoot condition may strengthen plantar intrinsic, and this in turn can improve arch structure.[13,14] Lastly, there is evidence that those running shod are less efficient with energy utilization.[15-17]

Though it is undeniable that surface hazards exist, there is really no evidence that they pose a risk to those running barefoot.

The Evidence-Con

There is no evidence that barefoot running causes injuries such as stress fractures or Achilles tendon injuries although clinical experience would say otherwise—it could be argued that most of these episodes were the result of inadequate adaptation. Though it is undeniable that surface hazards exist, there is really no evidence that they pose a risk to those running barefoot. Interestingly, the barefoot condition is favorable to microorganisms and infectious agents. Those running barefoot are at no greater risk for plantar verruca, are at less risk for tinea pedis, and are less likely to suffer a pseudomonas infection as a result of a puncture wound.[18-20] There are no studies to show that those needing motion control and/orthotics for diagnosed conditions will be at risk if undertaking barefoot running, but logic and clinical experience would say otherwise. Evidence as well as common sense is overwhelming for the high risk of injury for those barefoot runners with lack of protective sensation.[21-22] One study claimed increased impact and another noted an increase of shock transmission to the lower back with barefoot running. It appeared that these paradoxical findings were the result of the subjects being required to run with a heel strike while unshod.[23,24]

Minimalist Shoes

In an effort to be included in the barefoot running mania, some shoe companies have developed shoes that mimic barefoot running (minimalist shoes). The runner can garner the benefits from utilization of a barefoot running form but have some basic protection from surface hazards. The restrictions and confinements of running shoes are eliminated. The Nike Free and Vibram 5 Fingers are currently the best known, but other companies have released their own models or have them in development.

The Coaches' Perspective

Although not scientific evidence, anecdotal discussion with coaches sheds light on some perceived shortcomings as well as pluses to barefoot running. Firstly, a number of coaches believe that utilization of barefoot running as part of the overall training program (as the author did in high school) is beneficial for strengthening intrinsic musculature

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and improving form but observed (as did a number of clinicians) their runners getting overuse injuries as a result of overzealous incorporation of barefoot running. Ironically, runners who procured minimalist shoes such as Vibram 5 Fingers seemed to have even more injuries due to a false sense of "protection" when the purely barefoot condition would provide better feedback to take it easier. (Verbal communication, Coach Bill Strachan, MS July 2009)

Advising Your Runners

One of your running patients presents to your office with a multitude of questions about barefoot running and/or minimalist shoes. He indicates that he is considering barefoot running but would like your opinion. Evidence as well as experiences of fellow clinicians can be used to guide you. Some basic generalizations follow:

1) Those running barefoot do have a distinct gait pattern that is quite different from that of a shod runner.

* but there is no evidence to show that these changes result in reduced injuries or improved performance.

Some evidence exists that supports increased strength and size of the plantar intrinsic musculature in those who run barefoot.

2) Those running barefoot appear to experience reduced impact (collision) forces at foot strike.

* but attenuation of the forces by calf musculature may result in myotendinous injury such as Achilles tendinopathy.

* but there is no evidence to show that reduced impact results in reduced injuries or improved performance.

3) Those who are barefoot do have an improved proprioceptive feel for the surface and better joint position sense.

* but there is no evidence to show that this results in reduced injuries such as ankle sprains or improved performance.

4) Some evidence exists that supports increased strength and size of the plantar intrinsic musculature in those who run barefoot.

* but there is no evidence to show that this results in reduced injuries or improved performance.

5) Some evidence exists that barefoot running has more efficient energy utilization.

* but there is no evidence to show that this results in reduced in-

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juries or improved performance.

6) The evidence is clear that running barefoot would be risky for those with loss of protective sensation.

7) Although there is no evidence one way or the other, it would seem that those patients successfully treated with motion control shoes and/or orthotics for a biomechanically related condition would not be well served to begin a barefoot running program. Having said that, it is worth mentioning that barefoot running aficionados would counter that the changes in form, strengthening of musculature etc. could eliminate the biomechanical weakness or prevent it in the first place.

8) It would seem that the most important advice you can give your patient would be 1) choose a safe surface and 2) build up activity as slowly as one beginning a jogging program who has never jogged before, so as to allow the osseous and soft tissue structures time to adapt.

Key Point

A common theme in the above conclusions is that there is no evidence to support that barefoot running reduces injuries or improves performance, but it is very important to point out that the evidence does not support that barefoot running increases injury or reduces performance. Some of the claims may very well pan out to be true, but much more research is needed. ■

References

[1] American Podiatric Medical Association/American Academy of Podiatric Sports Medicine Position Statement on Barefoot Running. APMA Website. http://www.apma.org/MainMenu/News/MediaRoom/PositionStatements/APMA-Position-Statement-on-Barefoot-Run Accessed November 9, 2009.

[2] McDougall C: Born to Run: A Hidden Tribe, Superathletes, and the Greatest Race the World Has Never Seen. 1st edition, Alfred A. Knopf/Random House, New York, 2009.

[3] Robbins SE, Hanna AM: Running-related injury prevention through barefoot adaptations. Med Sci Sports Exerc 19: 148, 1987.

[4] Robbins SE, Gouw GJ: Athletic footwear: unsafe due to perceptual illusions. Med Sci Sports Exerc 23: 217, 1991.

[5] Ken Bob Saxton: Running Barefoot Web site. http://runningbarefoot.org/. Accessed March 27, 2009.

[6] Barefoot Ted's Adventures Web Site. http://www.barefootted.com/index.php?q=/. Accessed July 20, 2009.

[7] Divert C, Mornieux G, Baur H, et al.: Mechanical comparison of barefoot and shod running. Int J Sports Med 26: 593, 2005.

[8] Squadrone R, Gallozzi C: Biomechanical and physiological comparison of barefoot and two shod conditions in experienced barefoot runners. J Sports Med Phys Fitness 49: 6, 2009.

[9] Lieberman D, Venkadesan M, Werbel W, et al.: Foot strike patterns

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and collision forces in habitually barefoot versus shod runners. Nature 463: 531, 2010.

[10] Robbins S, Waked E, McClaran J: Proprioception and stability: foot position awareness as a function of age and footwear. Age Ageing 24: 67, 1995.

[11] Robbins S, Gouw GJ, McClaran J: Shoe sole thickness and hardness influence balance in older men. J Am Geriatr Soc 40: 1089, 1992.

[12] Kurz MJ, Stergiou N: Does footwear affect ankle coordination strategies? JAPMA 94: 53, 2004

[13] Rao UB, Joseph B: The influence of footwear on the prevalence of flat foot. A survey of 2300 children. J Bone Joint Surg Br 74-B: 525, 1992.

[14] Brugemann G,, Potthast W, Braunstein B, et al.: Effect of increased mechanical stimuli on foot muscles functional capacity [online abstract]. In: ISB XXth Congress—ASB 29th Annual Meeting. Cleveland, OH: American Society of Biomechanics; 2005:553.

[15] Burkett LN, Kohrt WM, Buchbinder R: Effects of shoes and foot orthotics on VO2 and selected frontal plane knee kinematics. Med Sci Sports Exerc 17: 158, 1985.

[16] Catlin MJ, Dressendorfer RH: Effect of shoe weight on the energy cost of running. Med Sci Sports Exerc 11: 80, 1979.

[17] Flaherty R: Running economy and kinematic differences among runners with foot shod, with the foot bare, and with the barefoot equaled for weight. [abstract].1994 [cited June 2009]. Available in SPORTDiscus with full text.

[18] van Haalen FM, Bruggink SC, Gussekloo J, et al.,: Warts in primary schoolchildren: prevalence and relation with environmental factors. Br J Dermatol 161: 148, 2009.

[19] Laughlin TJ, Armstrong DG, Caporusso J, et al.: Soft tissue and bone infections from puncture wounds in children. West J Med 166: 126, 1997.

[20] Pallar, A: Getting a Jump on Athletes Foot. Dermatology Insights 3: 30, 2002.

[21] Lavery LA, Walker SC, Harkless LB, et al.: Infected puncture wounds in diabetic and nondiabetic adults [erratum in: Diabetes Care 19: 549, 1996]. Diabetes Care 18: 1588, 1995.

[22] Jayasinghe SA, Atukorala I, Gunethilleke B, et al.: Is walking barefoot a risk factor for diabetic foot disease in developing countries? Rural Remote Health 7: 692, 2007.

[23] Komi PV, Gollhofer A, Schmidtbleicher D, et al.: Interaction between man and shoe in running: considerations for a more comprehensive measurement approach. Int J Sports Med 8: 196, 1987.

[24] Ogon M, Aleksiev AR, Spratt KF, et al.: Footwear affects the behavior of low back muscles when jogging. Int J Sports Med 22: 414, 2001.

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