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Comment on Barefoot Running

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A formal assessment of the quality of evidence indicates that much more research is needed to confirm the effect of barefoot running on risk of injury and on competitive performance. Reprint pdf · Reprint doc

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In any review, particularly with clinical implications, it is helpful if the authors assess the quality of evidence on which the conclusions and recommendations are based. The National Health and Medical Research Council recommends the following hierarchical schema for quality of evidence:

I	A systematic review of all relevant randomised controlled trials
II	At least one properly designed randomised controlled trial
III-1	Well-designed pseudo-randomised controlled trials (alternate allocation or some other method)
III-2	Comparative studies with concurrent controls and allocation not randomised (cohort studies), case-control studies, or interrupted time series with a control group
III-3	Comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group
IV	Case series, either post-test or pre-test and post-test.

This hierarchy indicates the degree to which bias has been eliminated by research design. Non-randomized and observational studies are classified as Levels III and IV. Reviewers in the Cochrane Collaboration usually include only randomized controlled trials (Levels I and II) in their reviews of health-care studies (see the Cochrane Reviewers' Handbook). Ioannidis et al. (2001, online) counter this exclusive stance in a discussion of the relative merits of interventional and observational studies.

As acknowledged in the present review, evidence that barefoot running reduces risk of injury appears to be entirely observational. As such, it is premature to recommend barefoot running for reducing the incidence of running-related injuries. Evidence of a beneficial effect of barefoot running on performance is better–possibly Level II–but as the author correctly identifies, randomized controlled trials are needed with performance in real or simulated competitions.

It is important that authors of reviews attempt to access all publications on a given topic. As most articles published before 1966 are not computer indexed, the author may have missed any pre-1966 studies that were not cited in more recent publications. McLellan (2001, online) has written a relevant editorial on this issue. Browsing old dusty journals packed away in the top floor of the library can leave one amazed with what is already known, the good quality of the research and the often elegant clear writing style. I wonder if these journals hide lost secrets on barefoot running.

The author has presented the evidence in a manner that is reasonably typical of reviews in the exercise science area. The presentation of evidence could be improved by greater emphasis on quantifying effects, preferably with meta-analytic techniques. The author has provided only rough estimates of differences in running economy between barefoot and shod running, and no quantification at all of effect sizes for injury. Incidence rates of injury or relative risks would give the reader a better idea of clinical relevance. A review

targeted at an audience of specialists and non-specialists would also benefit from precise definition of terms such as *impact* and from plain-language explanations of some technical terms.

An important issue in the review is the apparently questionable claims of shoe manufacturers about the benefits of their products. The running and jogging shoe industry is big business. In its advertising, claims have been made about various improvements in design and materials. Some shoes, for example, are designed to stabilize the foot and ankle by altering foot biomechanics, whereas others have extra cushioning to reduce transmission of peak impact force directly to foot and leg structures and possibly indirectly to other structures, such as the lower spine and neck. Any claims based on so-called corporate research need to be viewed with certain skepticism, unless the study was published in a peer-reviewed journal. Even then, corporate sponsorship of a study may still result in substantial bias in outcomes (Djulbegovic, 2000, online; Spurgeon, 2001, online).

An issue not addressed in the current review is the effect of individual differences in anatomy on the mechanisms and risk of injury associated with wearing of running shoes. Feet come in different shapes and sizes, they support bodies of different mass and posture, and their owners adopt different running styles. All this variability must be accommodated by what seem to be relatively few shoe designs. Market prices and regional availability further limit the runner's choice. A related issue is the effect of age on a shoe's characteristics, and an athlete's perception of shoe performance that is sub-standard through wear and tear. We apparently do not know whether runners increase their risk of injury by wearing inappropriate and/or worn-out shoes.

Also not addressed in this review is the issue of the role of shoes in the etiology of stress fractures, a common injury in distance runners. The consequences of a stress fracture, particularly those in the feet, are distressing. Tarsal navicular stress fractures may remain undiagnosed for months and are notorious for poor healing. If the fracture is managed non-surgically (non-weight-bearing cast for 6 to 8 weeks), return to sport can take up to six months. Painful fracture non-union requires internal fixation (Bojanic and Pecina, 1997; Khan et al., 1994; Weinfeld et al., 1994). Metatarsal stress fractures are also common in runners (Weinfeld et al., 1994).

Not wearing shoes may also accelerate development of other injuries in vulnerable runners. Some of the common and most difficult injuries of the foot to diagnose and treat, particularly if the injury becomes chronic, are presented below.

Inflammation of the sesamoid complex of the first metatarsophalangeal joint is relatively common in runners, as is inflammation of the peritendinous structures around the sesamoid complex. A single event (a fall or direct blow on the sole of the foot) can also trigger this type of injury (Potter et al., 1992). Diagnostically, it is important to rule out avascular necrosis, a fractured sesamoid, flexor hallucis longus tendinitis, capsulitis and synovitis of the second metatarsophalangeal joint.

A majority of patients presenting with plantar heel pain have a mechanical etiology, which may also be accelerated by not wearing shoes. Most of these patients are overweight, and they hyperpronate and have intrinsic instability and/or fat-pad atrophy. From an etiology standpoint, seropositive and seronegative spondyloarthropathies and crystal deposition arthropathies need to be excluded (Graham, 1983; Lapidus et al., 1965). Conservative treatment usually involves wearing more supportive shoes and minimizing barefoot walking. Fat pad syndrome (bruising of the fat pad from landing on a stone, for example) may mimic plantar fasciitis and take weeks to heal.

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