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Barefoot Training Survey: Novel Experiences of Barefoot Training on Habitually Shod Runners

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Abstract

Running is the most popular means of physical activity among people all over the world. Shoe wear design has evolved over a period of time, however, running-related injuries continue to surge. Barefoot form of running has been advocated as a possible training approach to reap the benefits of running in the era of modern shoes. Limited evidence of reduction in torques and forces on the lower extremities is available for barefoot running, however, how far this corresponds to injuries is yet to be studied. The aim of this survey was to examine factors related to performance and injury in runners who have tried barefoot training with an emphasis on including a habituation phase to accustom to barefoot running. A 10-question survey regarding the experiences of runners (sprinters and marathoners) athletes who participated in barefoot training program was prepared and communicated electronically through email. All participants were state and national level athletes and habitually trained in shoe before participating in the barefoot training. A total of six participants who took part in the training were given the survey questionnaire. About 60% of respondents believed barefoot training will help to heal from repetitive injuries widely supported by media in form of blogs, books, and scientific papers in this area. About 17% of these respondents sought suggestions from their coaches, physical therapists, and trainer to pursue barefoot training. Initially, participants were apprehensive of participating into barefoot training (67%). Participants preferred running on grass and treadmill to prevent from injury. All participants agreed on implications of barefoot training to achieve sports-specific performance improvement in running performance. No injuries were reported after the completion of barefoot training with no new injuries being reported. The previous studies have reported biomechanical changes caused by barefoot training with a hypothetical prediction of reducing injury risk. The survey showed that barefoot training was perceived to be positive experience for all the runners with no injuries being reported at the end of the training.

Keywords: Barefoot running, Barefoot training, Injury risk, Running-related injuries, Survey

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Introduction

Running is the most popular means of physical activity worldwide with over 50 million participants reported in the USA. With a recurrent growth rate of almost 57% during the last decade, the number of runners participating for organized races in the US was reduced in 2019 in line with downward trend of mass participating in recreational road races.[1] Running shoes have witnessed a dramatic change in its structure and function over the past 40 years. The present-day running shoe is no less than an engineering marvel with its technical descriptors such as support, motion control, minimalist, and barefoot. Despite the technological innovations in shoe wear design, this has not reduced the running injury rates per capita. The prevalence of running injuries in the past 30 years has shown injury frequencies to vary between 15% and 85%.[2]

The concept of barefoot running is not new. Bramble and Liebarman[3] have studied the evolution of Homo sapiens and endurance running. The authors reported that human has run minimally shod or barefoot for millions of years until recently when the running shoe became an important part of running gear. Despite this, there is weak or limited evidence to support the practice of using shoe inserts, cushioned heels, and pronation control systems to prevent injuries.[4] The scientific interest into studying barefoot running and limited evidence of using different shoes for injury prevention has coincided with greater number of studies being focused on evolving the practice of barefoot training in athletic settings.

With this focus, health-care professionals are faced with safety concerns regarding implementation of these training programs. Often, the scientific literature underestimates the utility of studying such novel systems of training and clinicians fail to embrace the alternative thinking regarding footwear needs and prescriptions. Injuries reported on implications of barefoot running or training are often found to be case studies documenting or reporting occasional injury. Furthermore, these injuries are also attributed to improper transitioning during times when incremental loads are placed at a greater pace than rate of repair.

Therefore, it is imperative to gather data on novel experiences of runners who have transitioned into barefoot

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training/running form and provide ancillary data regarding their perceptions of barefoot training. The purpose of this survey was to examine performance and injury-related factors for the runners who transitioned from habitually shod to barefoot training or running.

Methods

This survey is a part of an experimental study aimed at evaluating the effects of barefoot training on biomechanical characteristics in runners. This study was approved by the Institutional Ethics Committee, School of Physiotherapy, RK University, Rajkot, Gujarat (SPT/IEC/2019/2).

A 10-question survey was prepared and completed by over 45 participants who took part in the supervised barefoot transitioning program for 8 weeks. The questionnaire was conceptualized, executed and analysed by the authors. Since all the runners were habitually shod and transitioning to barefoot training, it was essential that components of questionnaire consisted of getting to know their experience of being trained by this approach. We enquired about whether the runners had ever tried barefoot training previously, whether it was ever used during the regular training sessions during off-season or post-season period. If so, we questioned if it made a difference to their injury rates and performance. The specific questions given to participants are provided in Results section and in Figures 1-7. The survey was released online using Google Forms and paper forms were directly given to the participants in person. To be included, runners have completed the transitioning program training of 8 weeks and had enough experience with barefoot training to be able to answer all questions.

Results

The study had six participants who participated for 8-week barefoot training program. A large portion of participants chose barefoot training to heal from repetitive injuries (60%) due to media reports through blogs, books, and scientific papers. Almost 17% of these participants chose to run barefoot on suggestion of physical therapist, coach, or trainer [Figure 1]. Almost 67% of participants were apprehensive to begin with barefoot training [Figure 2]. About 67% of these respondents also reported to incorporate some form of barefoot training into their weekly mileage [Figure 3]. The majority of respondents (64%) ran a small portion of running barefoot with <10% of weekly distance [Figure 3]. All participants believed running on grass and treadmill would help them prevent injuries. About 33% of respondents reported walking on city sidewalk [Figure 4]. All participants reported on barefoot training or running to improve specific aspects of their running performance [Figure 5]. Surprisingly, despite being habitually shod runners all their lives, none of the respondent saw barefoot form as an alternative to in-shoe training [Figure 5]. Awareness on different types minimalist shoe was also equally divided [Figure 6]. Following the completion of 8-week barefoot training, interesting findings were observed. About 50% of respondents reported having improved overall body mechanics, improved foot control (33%), and improved balance (17%) [Figure 7]. No injuries were reported after the completion of barefoot training with no new injuries being reported. However, 50% of respondents believed that the training may have impacted the structural changes to foot (17%), ankle (17%), and hip (17%). Respondents did report having skin blisters, cuts, and wounds but went away quickly (50%) without affecting their overall performance.

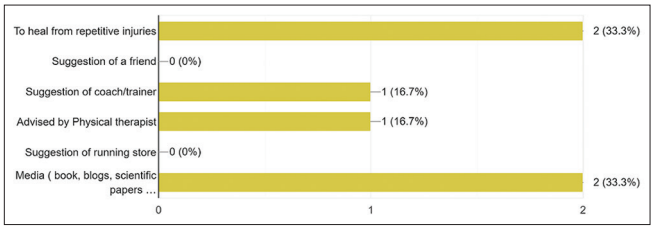

Figure 1: Why did you begin barefoot training?

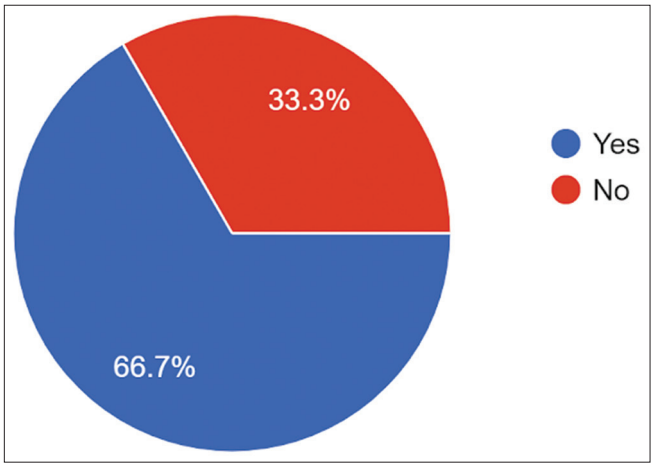

Figure 2: Were you apprehensive before participating in a barefoot transitioning training?

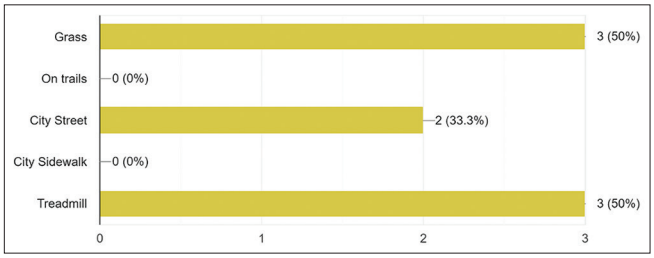

Figure 3: What may be approximate% of your weekly distance/mileage running barefoot?

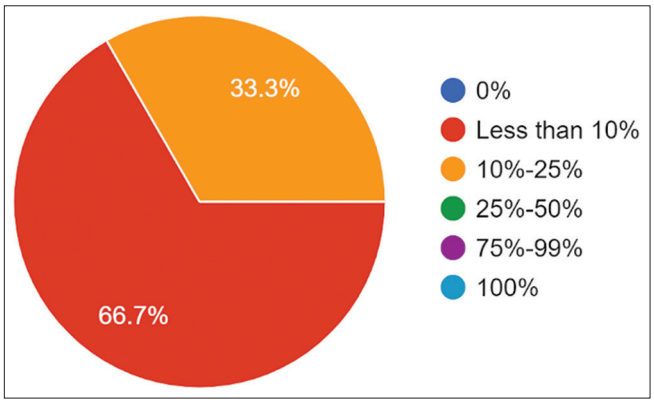

Figure 4: On what surface did you run barefoot?

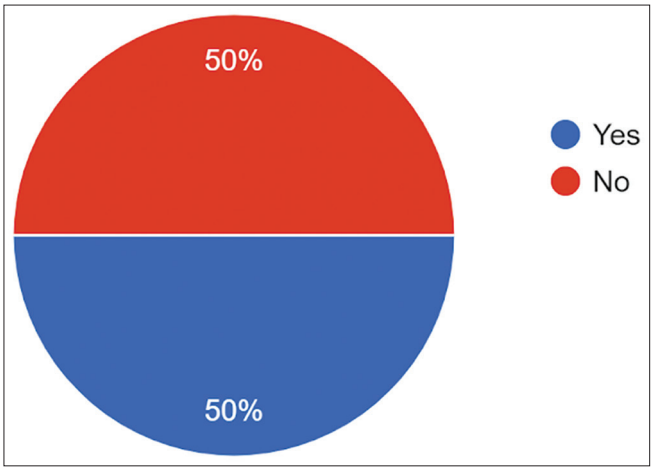

Figure 5: Your view on barefoot training/running

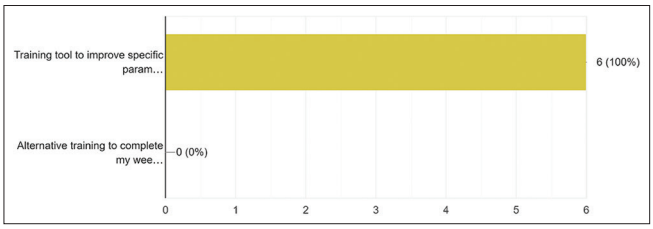

Figure 6: Are you aware about any minimalist shoes (Vibram Fivefingers, Terra Plana Evo, etc.)

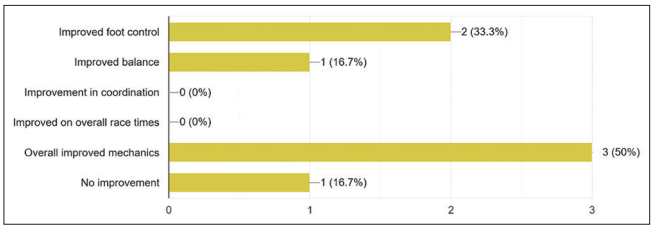

Figure 7: After completion of barefoot transitioning training, have you experienced any of the following?

Discussion

The association between frequency of loading and injury risks is yet to be validated in the literature for running-related injuries (RRIs). In-Shoe training has shown to alter loading patterns which can reduce the risk of sustaining running related injuries. To our surprise, knee injuries were the most significant beneficiary of barefoot training program with major clinical improvements. This is even more significant due to greater number of knee injuries being reported in running. To support, a large number of our participants experienced no new injuries after participating in barefoot training.

Vertical loading rates are considered to be a relevant indicator of injury susceptibility in sports. Loading rates and peak impact forces are widely reported to increased incidence of RRIs like tibial stress fractures and plantar fasciitis.[5-7] The first foot strike pattern is also an important factor in forces generated during running in habitually shod and barefoot running. However, none of the questions used in this survey emphasized on strike pattern. Habitually shod runners have displayed midfoot to hindfoot first strike on the ground compared to barefoot runners who generally land with forefoot strike pattern.

There is limited evidence on shoe wear prescription related to pronation control and/or cushioned heels to prevent injuries.[5] The next controversial practice surrounding shoe wear prescription is related to arch type. Injury risk for male or female recruits was found to be of little difference following advice of shoe wear prescription based on arch type.[8] Minimal shoes have shown promise in improving rehabilitation outcomes in chronic plantar fasciitis with an overall reduction of plantar foot pain.[9] It is hypothesized that modern running shoe due to its stiff sole characteristics and arch supports tends to weaken the natural protective abilities of intrinsic foot muscles and arch strength. This, in turn, places increasing demands on plantar fascia, leading to foot muscle weakness, excessive foot pronation, and lower extremity instability.[10]

Despite increasing scientific interest into barefoot running and training, health-care professionals are sceptical on promoting barefoot and minimal footwear running. This notion has often supported increasing injury risks associated with barefoot/minimal footwear running. To further understand the consequences of sudden change to a new training practice, it is pertinent to emphasize on an adequate cooling off or transition phase for habitually shod runners to switch toward minimal or barefoot form of running. An interesting yet clinically important observation of this survey was that majority of our respondents did not report any adverse effects of barefoot training and if they were, got resolved fairly quickly. A long-term adaptation to barefoot training can be an important factor to stratify overuse injury risks.[11] During running, the soft tissues, tendons, and ligaments in particular help conserve energy during the loading phase of running.[4] A sudden transition from heeled shoe to barefoot can place additional stress on these tendons. Habitually shod runners have shown continuous heel strike even after being introduced to barefoot gait.[10] Therefore, it is recommended to place the habitually shod athletes into an appropriately timed and phased period of transition to allow the body to acclimatize to new training loads.

Barefoot running and training influence biomechanics by having a shorter stride and increased frequency of steps per minute.[12] It is argued that barefoot runners develop reduced stride length, despite controlling speed of running.[12] This influences vertical loading rates when compared to habitually shod runners.[10,12] Increments in torque at the knee and hip joints followed by adaptations in cadence and stride length are also observed in previous studies.[12] Modern running shoes increase joint torques throughout the lower extremity often due to elevated heel and increased cushioning under the medial aspect of foot. These material adjustments further accentuate any mechanical loads placed on the lower extremity potentially exposing the risk of developing medial sided osteoarthritis knee.[13,14] However, these links between torque development and injury occurrence are yet to be fully explored. Interestingly, the injury that has shown improved outcomes following barefoot training was at the knee. This may be significant as majority of RRIs are attributed to knee joint followed by lower leg and back.[15]

Our survey was not without limitations. The length of questionnaire was kept short and specific to gather information on perceptions and experiences of being trained in a new environment of barefoot. The timing of the survey was also planned after 2 weeks of completing the training which may have accounted for recall bias for our study.

Conclusions

RRIs are often cited as the most frequent injuries reported in the literature. With new trends of barefoot training, it is pertinent to understand the novel experiences of trainees to help program the training sessions in line with the needs of the athlete. While no cause and effect relationships can be drawn from a survey, we have found some interesting trends. First, we believed that barefoot training will lead to more difficulties and injuries but no new injuries being reported by the respondents. Most importantly, respondents who are also habitually shod (shoe) runners experienced improved body mechanics, foot control, and balance after the training. Finally, the survey results indicated that there were no skin blisters, cuts, and abrasions reported following barefoot training. This consolidates our belief that a safe and graduated progression of barefoot training can be a novel experience and a potential recommendation for health-care practitioners dealing with running injuries.

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