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Self-selected Foot Strike Patterns in Runners when Transitioning from the Shod to Barefoot Condition: A Systematic Review of the Literature

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PURPOSE AND BACKGROUND

Recent research has begun to focus on foot strike patterns as they relate to injuries in runners. Runners who employ a rear-foot strike (RFS) pattern (in which the heel lands before the ball of the foot) are more likely to experience repetitive stress injuries such as tibial stress fractures, patellofemoral pain syndrome (PFPS), and plantar fasciitis. Conversely, runners demonstrating a forefoot strike (FFS) pattern (defined as the ball of the foot-usually the 4th and 5th metatarsal heads-landing before the heel) are more susceptible to Achilles tendon, plantarflexor, and metatarsal injuries. Several systematic studies have concluded that barefoot runners employed a FFS pattern while shod runners used a RFS pattern. The purpose of this systematic review was to determine the effects of transitioning from traditionally shod running to barefoot running on self-selected initial contact patterns in long distance runners.

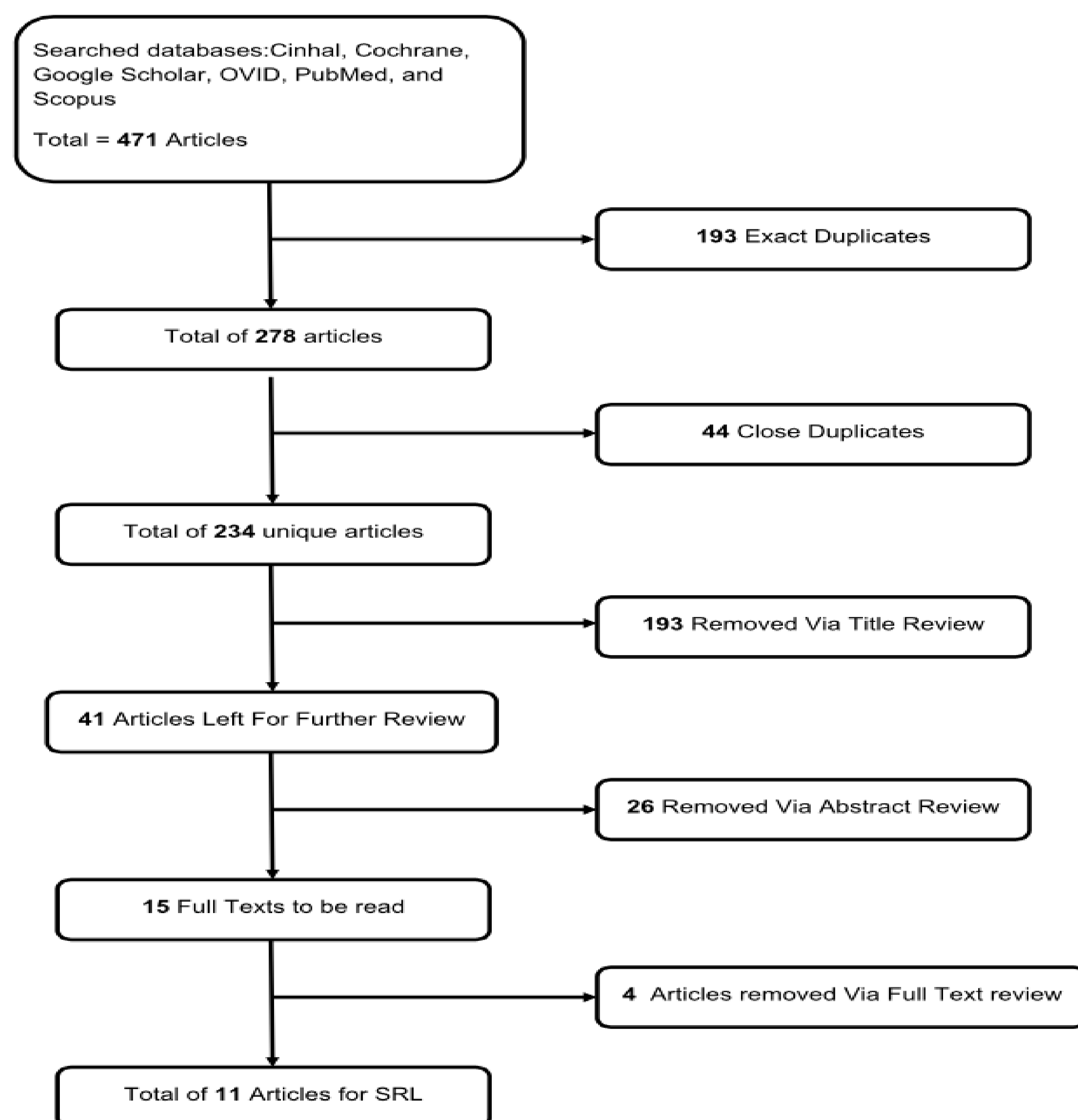


METHODS

Databases searched: Ovid, PubMed, SCOPUS, CINAHL, The Cochrane Library, Google Scholar

Search Terms: Barefoot, Shod, Minimalist, Transition, Pattern, and Initial Contact

Articles were eliminated by title, abstract, and then by content. The final 11 articles were read in full and graded using the PEDro scale.



RESULTS

Author, Year	Subjects (n)	Study Design	PEDro Score	Results
Chambon (2014)	n=15	Comparative	7	Angles of ankle and foot differed bare condition=ankle joint in PF and lower foot/ground angle; Shod=DF & higher foot/ground angle at initial contact; however, all="midfoot strike" on Strike Index
Hamil (2010)	n=10	Comparative	6	Participants showed a change from rearfoot pattern in all shod conditions (SI < .33) to a midfoot pattern (.33 < SI < .66)
Kasmer (2014)	n=4	Comparative	7	More runners adopted a more posterior initial contact after the 50 km run in the traditional shoe type than in the minimalist shoe type
McCallion (2014)	n=14	Comparative	7	No significant main effect of condition on absolute FSP data. Regardless of condition, most participants adopted a mid-foot strike pattern [42-64% MFS observed overall]
Moore (2015)	n=10	Comparative	6	Post transition there was a general trend for runners to adopt a more anterior footstrike in all three conditions.
Munoz (2015)	n=80	Comparative	7	High rearfoot strike and rearfoot strike=more frequent in shod condition; when unshod, foot strike pattern changes significantly becoming closer to midfoot or forefoot strike
Schutte (2013)	n=12	Comparative	6	Barefoot runners had less ankle dorsiflexion (forefoot strike pattern) with immediate adaptations in transition
Sinclair (2012)	n=12	Comparative	6	Barefoot running was associated with significantly greater plantar-flexion at footstrike and range of motions to peak dorsiflexion
Thompson (2015)	n=20	Comparative	6	Subjects who were natural RFS runners switched to a plantarflexed position at ground contact when changing from shod to barefoot
Williams (2012)	n=20	Comparative	6	Measured ankle flexion during various conditions at Initial Contact: shod FFS -12.46 (Plantar Flexion), shod RFS = 14.5.(DorsiFlexion) BF 0.03.(Dorsi Flexion) P value <.01
Wilson (2014)	n=19	Observational	6	No significant change in foot strike pattern after or immediate introduction of minimalist footwear or after subsequent 2-week training period

CLINICAL RELEVANCE

- Barefoot running may reduce incidence of injury as a result of a change in foot strike pattern.
- Nine of the 11 studies supported a self-selected change in foot-strike with barefoot running.
- Foot-strike motor patterns developed over years of running may prevent acute changes in foot-strike pattern when transitioning between shod and barefoot.
- It would be good clinical decision making for physical therapists to include education on proper foot-strike pattern for a transition from shod to barefoot running, and evaluation and feedback instructions on how to achieve a FFS.
- There is currently no standard protocol for transitioning from shod to barefoot running.
- Adapting to barefoot running should occur gradually in order to allow the body to acclimate to the newly imposed biomechanical stresses.
- Understanding the natural tendency to change to a MFS or FFS pattern following transition to barefoot can be useful in guiding physical therapy diagnoses and interventions.

CONCLUSION

The literature supported that a runner's initial contact changed from a RFS pattern to a more anterior foot-strike pattern when transitioning from habitually running shod to running barefoot. Future studies should focus on the incidence of injury while transitioning acutely or gradually from shod to barefoot running. This will help determine if a transition protocol is necessary for a runner to safely acclimate between shod and barefoot.



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