7 Running 512es 52r5 preventing 12wer limb 5running 5njuries 1n5 adults (Review) 7

RelphN,GGre5veWH,ArmW@ongR,PriorT4,SpencerS,GriffihWB,4eyP,15ngleyB

Relph N,GGre5veWH,ArmW@ong R,PPrior T4,SSpencer S,GGriffihWB,4ey P,15ngley B.O
RunningWhoeWforPpreveningPowerImJunningnjurieWnSdulWO
*GL, z[aneDatabaseLfSystemati, &ReviewsO*2022,OWue8.Ar©No.:C4013368.O
DOI:O10.1002/14651858.CD013368.pub2.

TABLE OF CONTENTS

[Interventi2n5Review]

Running5s12es5f2r5preventing5l2wer5limb5running5injuries5in5adults

Nicol5Relph[1], Henrike Gre5veW[2], RoWWArmWong[3], Trevor4 Prior[4], S5lly Spencer[5], Ian B GriffithW[6], P5ol54ey[1], Ben L5ngley[7]

[1]F5cul@yofHe5l@h, Soci5l C5re & Medicine, Edge Hill UniverWi@y, OrmWkirk, UK. [2]Liverpool John Moores UniverWi@y, Liverpool, UK. [3]InW@i@u@e of He5l@h, UniverWi@y of CumJri5, C5rliWle, UK. [4]Podi5@ic Surgery, Homer@on UniverWi@y HoWpi@5l, London, UK. [5]He5l@h ReWe5rch InW@i@u@e, F5cul@y of He5l@h, Soci5l C5re & Medicine, Edge Hill UniverWi@y, OrmWkirk, UK. [6]Pure Spor@W Medicine, London, UK. [7]4ep5r@men© of Spor@ & PhyWic5l Ac@ivi@y, Edge Hill UniverWi@y, OrmWkirk, UK

62nta4t:5 Nicol5 Relph, Nicol5.Relph@edgehill.5c.uk.

Edit2rial5gr2up:5 Cochr5ne Bone, Join@ 5nd MuWcle Tr5um5 Group.
Publi4ati2n5status5and5date:5 New, puJliWhed in IWWue 8, 2022.

6itati2n:5 Relph N, Gre5veW H, ArmWong R, Prior T4, Spencer S, Griffi@hW IB, 4ey P, L5ngley B. Running WhoeW for preven@ing lower limJ running injurieW in 5dul@W. *CL, z[ane Database & f Systemati, Reviews* 2022, IWWue 8. Ar@. No.: C4013368. 4OI: 10.1002/14651858.CD013368.pub2.

A B S T R A C T

Ba4kgr2und

Lower/limJ running injurieW 5re common. Running WhoeW h5ve Jeen propoWed 5W one me5nW of reducing injury riWk. However, @here iW uncer@5in@y 5Wo@o how effec@ive running WhoeW 5re for @he preven@ion of injury. I@ iW 5lWo uncle5r how @he effec@W of differen@ ch5r5c@eriW@icW of running WhoeW preven@ injury.

Obje4tives

To 5WWeWW @he effec@W (Jenefi@W 5nd h5rmW) of running WhoeW for preven@ing lower/limJ running injurieW in 5dul@ runnerW

Sear415met12ds

We We5rched @he following d5@5J5WeW: CENTRAL, ME4LINE, EmJ5We, AME4, CINAHL PluW 5nd SPORT4iWcuW pluW @ri5l regiW@erW WHO ICTRP 5nd Clinic5lTri5lW.gov. We 5lWo We5rched 5ddi@ion5l WourceW for puJliWhed 5nd unpuJliWhed @ri5lW. The d5@e of @he We5rch w5W June 2021.

Sele4ti2n54riteria

We included r5ndomiWed con@rolled @ri5lW (RCTW) 5nd qu5Wi/RCTW involving runnerW or mili@5ry perWonnel in J5Wic @5ining @h5@ ei@her comp5red 5) running Whoe wi@h 5 non/running Whoe; J) differen@ @ypeW of running WhoeW (minim5liW@, neu@5l/cuWhioned, mo@ion con@rol, W@5Jili@y, Wof@ midWole, h5rd midWole); or c) foo@we5r recommended 5nd Welec@ed on foo@ poW@ure verWuW foo@we5r no@ recommended 5nd no@ Welec@ed on foo@ poW@ure for preven@ing lower/limJ running injurieW. Our prim5ry ou@comeW were numJer of people Wu5@ining 5 lower/limJ running injury 5nd numJer of lower/limJ running injurieW. Our Wecond5ry ou@comeW were numJer of runnerW who f5iled @o re@urn @o running or @heir previouW level of running, runnerW' W5@iWf5c@ion wi@h foo@we5r, 5dverWe even@W o@her @h5n muWculoWkele@5l injurieW 5nd numJer of runnerW requiring hoWpi@5l 5dmiWWion or Wurgery, or Jo@h, for muWculoWkele@5l injury or 5dverWe even©

Data542lle4ti2n5and5analysis

Two review 5u@horW independen@ly 5WWeWWed W@udy eligiJili@y 5nd performed d5@5 ex@5c@ion 5nd riWk of Ji5W 5WWeWWmen©The cer@5in@y of @he included evidence w5W 5WWeWWed uWing GRA4E me@hodology.

Main5results

We included 12 @ri5lW in @he 5n5lyWiW which included 5 @o@5l of 11,240 p5r@icip5n@W. In @ri5lW @h5@ W@5@ed from 6 @o 26 weekW 5nd were c5rried ou@ in Nor@h Americ5, Europe, AuW@5li5 5nd Sou@h Afric5. MoW@ of @he evidence w5W low or very low cer@5in@y 5W i@ w5W no@ poWWiJle @o Jlind runnerW @o @heir 5lloc5@ed running Whoe, @here w5W v5ri5@ion in @he defini@ion of 5n injury 5nd ch5r5c@eriW@icW of foo@we5r, 5nd @here were @oo few W@udieW for moW@ comp5riWonW

We did no@ find 5ny @ri5lW @h5@ comp5red running WhoeW wi@h non/running WhoeW

Neutral/4us1i2ned5versus5minimalist5(55studies,5766 5parti4ipants)

Neu@5l/cuWhioned WhoeW m5y m5ke li@@le or no difference @o @he numJer of runnerW WuW@5ining 5 lower/limJ running injurieW when comp5red wi@h minim5liW@ WhoeW (low/cer@5in@y evidence) (riWk r5@io (RR) 0.77, 95% confidence in@erv5l (CI) 0.59 @o 1.01).

One @ri5l repor@ed @h5@ 37% 5nd 92% of runnerW were W5@iWfied wi@h @heir neu@5l/cuWhioned or minim5liW@ running WhoeW reWpec@ively (RR 0.73, 95% CI 0.47 @o 1.12). Ano@her @ri5l repor@ed me5n W5@iWf5c@ion WcoreW r5nged from 4.0 @o 4.3 in @he neu@5l/cuWhioned group 5nd 3.6 @o 3.9 in @he minim5liW@ running WhoeW group ou@ of 5 @o@5l of 5. Hence neu@5l/cuWhioned running WhoeW m5y m5ke li@@le or no difference @o runner W5@iWf5c@ion wi@h foo@we5r (low/cer@5in@y evidence).

M2ti2n54 2ntr2l5versus5neutral/5 4us1i2ned5(25studies,5 4215parti4ipants)

I@ iW uncer@5in whe@her or no@ mo@ion con@rol WhoeW reduce @he numJer of runnerW WuW@5ining 5 lower/limJ running injurieW when comp5red wi@h neu@5l/cuWhioned WhoeW Jec5uWe @he qu5li@y of @he evidence h5W Jeen 5WWeWWed 5W very low cer@5in@y (RR 0.92, 95% CI 0.30 @o 2.81).

S2ft5mids2le5versus5h ard5mids2le5(25studies,5 10955parti4ipants)

Sof@ midWole WhoeW m5y m5ke li@@le or no difference @o @he numJer of runnerW WuW@5ining 5 lower/limJ running injurieW when comp5red wi@h h5rd midWole WhoeW (low/cer@5in@y of evidence) (RR 0.82, 95% CI 0.61 @o 1.10).

Stability5versus5neutral/5 4us1i2ned5(15study,5 575parti4ipants)

I@ iW uncer@5in whe@her or no@ W@5Jili@y WhoeW reduce @he numJer of runnerW WuW@5ining 5 lower/limJ running injurieW when comp5red wi@h neu@5l/cuWhioned WhoeW Jec5uWe @he qu5li@y of @he evidence h5W Jeen 5WWeWWed 5W very low cer@5in@y (RR 0.49, 95% CI 0.18 @o 1.31).

M2ti2n54 2ntr2l5versus5stability5(15study,5 565parti4ipants)

I@ iW uncer@5in whe@her or no@ mo@ion con@rol WhoeW reduce @he numJer of runnerW WuW@5ining 5 lower/limJ running injurieW when comp5red wi@h W@5Jili@y WhoeW Jec5uWe @he qu5li@y of @he evidence h5W Jeen 5WWeWWed 5W very low cer@5in@y (RR 3.47, 95% CI 1.43 @o 8.40).

Running5s12es5pres4ribed5and5sele4ted52n5f22t5p2sture5(35studies,5 72035parti4ipants)

There w5W no evidence @h5@ running WhoeW preWcriJed J5Wed on W@5@ic foo@ poW@ure reduced @he numJer of injurieW comp5red wi@h @hoWe who received 5 Whoe no@ preWcriJed J5Wed on foo@ poW@ure in mili@5ry recrui@W (R5@e R5@io 1.03, 95% CI 0.94 @o 1.13). SuJgroup 5n5lyWiW confirmed @heWe findingW were conWiW@en@ Je@ween m5leW 5nd fem5leW. Therefore, preWcriJing running WhoeW 5nd Welec@ing on foo@ poW@ure proJ5Jly m5keW li@@le or no difference @o lower/limJ running injurieW (moder5@e/cer@5in@y evidence).

45@5 were no@ 5v5il5Jle for 5ll o@her review ou@comeW

Aut12rs'54 2n4lusi2ns

MoW@ evidence demonW@r5@eW no reduc@ion in lower/limJ running injurieW in 5dul@W when comp5ring differen@ @ypeW of running WhoeW Over5ll, @he cer@5in@y of @he evidence de@ermining whe@her differen@ @ypeW of running WhoeW influence running injury r5@eW w5W very low @o low, 5nd 5W Wuch we 5re uncer@5in 5W @o @he @rue effec@W of differen@ @ypeW of running WhoeW upon injury r5@eW

There iW no evidence @h5@ preWcriJing foo@we5r J5Wed on foo@ @ype reduceW running/rel5@ed lower/limJ injureW in 5dul@W. The evidence for @hiW comp5riWon w5W r5@ed 5W moder5@e 5nd 5W Wuch we c5n h5ve more cer@5in@y when in@erpre@ing @heWe findingW However, 5ll @hree @ri5lW included in @hiW comp5riWon uWed mili@5ry popul5@ionW 5nd 5W Wuch @he findingW m5y differ in recre5@ion5l runnerW

Fu@ure reWe5rcherW Whould develop 5 conWenWuW defini@ion of running Whoe deWign @o help W@5nd5rdiWe cl5WWific5@ion. The defini@ion of 5 running injury Whould 5lWo Je uWed conWiW@en@ly 5nd confirmed Jy 5 he5l@h pr5c@i@ionerW More reWe5rcherW Whould conWider 5 RCT deWign @o incre5We @he evidence in @hiW 5re5. L5W@ly, fu@ure work Whould look @o explore @he influence of differen@ @ypeW or running WhoeW upon injury r5@eW in Wpecific WuJgroupW

PLAIN LANGUAGE SUMMARY

Running5s12es5f2r5preventing5l2wer,limb5running5injuries5in5adults

Title

4o differen@ @ypeW of running WhoeW ch5nge @he riWk of developing 5 lower/limJ injury?

Key5messages

Neu@5l/cuWhioned@hoeW@m5y@m5ke@li@@le@or@no@difference@@o@@he@numJer@of@runnerW@u@W@5ining@injurieW@or@foo@ve5r@W5@W5c@ion@comp5red wi@h@minim5liW@@hoeW

I@@W@uncer@5in@if@mo@ion@con@rol@hoeW@reduce@@he@numJer@of@runnerW@u@W@5ining@injurieW@comp5red@wi@h@neu@5l/cuWhioned@hoeW

Soft@midWole@hoeW@m5y@m5ke@li@@le@or@no@difference@@o@@he@numJer@of@runnerW@u@W@5ining@injurieW@comp5red@wi@h@h5rd@midWole@hoeW

I@@W@uncer@5in@if@W@5Jili@y@hoeW@reduce@@he@numJer@of@runnerW@u@W@5ining@injurieW@comp5red@wi@h@neu@5l/cuWhioned@hoeW

I@@W@uncer@5in@whe@her@or@no@@mo@ion@con@rol@hoeW@reduce@@he@numJer@of@runnerW@u@W@5ining@5@lower/limJ@running@injurieW@when@comp5red wi@h@W@5Jili@y@hoeW

PreW@riJing@running@hoeW@5nd@Welec@ing@on@foo@@poW@ure@proJ5Jly@m5keW@li@@le@or@no@difference@@o@running@injurieW

Fu@ure@reWe5rcherW@Whould@develop@5@conWenWuW@defini@ion@of@running@hoe@deWign@@o@help@W@5nd5rdiWe@cl5WWific5@ion.@The@defini@ion@of@5 running@injury@Whould@Je@uWed@conWiW@en@ly@5nd@confirmed@Ji@5@he5l@h@pr5c@i@ionerW.@ReWe5rcherW@Whould@conWider@5@r5ndomiWed@con@rolled @ri5l@deWign@@o@incre5We@@he@evidence@in@@hiW@5re5@5nd@explore@@he@influence@of@differen@@ypeW@of@running@hoeW@upon@injury@r5@eW@in@Wpecific WuJgroupW

Running shoes and running injuries

Running@hoeW@5re@deWigned@wi@h@fe5@ureW@@h5@@look@@o@reduce@foo@@mo@ion@or@how@much@force@iW@5pplied@@o@@he@Jody,@wi@h@5@view@@o@reducing running/injury@riWk.@J5Wed@upon@@heir@deWign@fe5@ureW@running@hoeW@m5y@Je@Jro5dly@cl5WWified@5W@mo@ion@con@rol,@W@5Jili@y@or@neu@5l/ cuWhioned@5nd@5W@minim5liW@@if@@hey@look@@o@provide@li@@le@movemen@@con@rol@or@cuWhioning@fe5@ureW

W1at5did5we5want5t25find52ut?

We@w5n@ed@@o@find@ou©

whe@her@differen@@ypeW@of@running@hoeW@could@reduce@@he@riWk@of@developing@lower/limJ@running@injurieW

whe@her@preW@riJed@running@hoeW@could@reduce@@he@riWk@of@developing@lower/limJ@running@injurieW@comp5red@@o@non/preW@riJed@running shoeW

W1at5did5we5d2?

We@We5rched@for@W@udieW@@h5@@comp5red@running/injury@r5@eW@(numJer@of@runnerW@injured@or@@o@5l@numJer@of@injurieW)@Je@ween@groupW@of runnerW@or@mili@5ry@perWonnel@who@wore@differen@@ypeW@of@running@hoeW

We@comp5red@5nd@Wumm5riWed@@heir@reWul@W@5nd@r5@ed@our@confidence@in@@he@evidence,@J5Wed@on@f5c@orW@Wuch@5W@W@udy@me@hodW

W1at5did5we5find?

We@found@12@W@udieW@nine@of@which@5WWeWWed@leiWure@or@recre5@ion5l@runnerW@5nd@@hree@in@mili@5ry@popul5@ionW.@To@5l@of@11,240@p5r@icip5n@W were@included@5croWW@5ll@W@udieW@wi@h@@he@l5rgeW@@W@udy@including@3952@p5r@icip5n@W@5nd@@he@Wm5lleW@@24.@The@following@comp5riWonW@were made.

/@Neu@5l/cuWhioned@comp5red@@o@minim5liW@@running@hoeW@(5@W@udieW,@766@p5r@icip5n@W)

/@Mo@ion@con@rol@comp5red@@o@neu@5l/cuWhioned@running@hoeW@(2@W@udieW,@421@p5r@icip5n@W)

/@Soft@comp5red@@o@h5rd@running@hoeW@(2@W@udieW,@1095@p5r@icip5n@W)

/@S@5Jili@y@comp5red@@o@neu@5l/cuWhioned@running@hoeW@(1@W@udy,@57@p5r@icip5n@W)

/@Mo@ion@con@rol@comp5red@@o@W@5Jili@y@running@hoeW@(1@W@udy,@56@p5r@icip5n@W)

/@PreW@riJed@comp5red@@o@non/preW@riJed@running@hoeW@(3@W@udieW,@7203@p5r@icip5n@W)

The@W@udieW@did@no@@uWe@@he@W5me@defini@ion@of@injury@5nd@Wome@uWed@defini@ionW@of@injury@@h5@@included@injurieW@@o@p5r@W@of@@he@Jody@o@her @h5n@juW@@@he@lower@limJ.

Main5results

We@found@@he@following@wi@hin@our@review.

Neu@5l/cuWhioned0WhoeW0n5y0n5ke0i@de0r0no0difference@0@the0numJer0of0unnerW0uW5ining05 0ower/limJ0unning0njurieW0r0unner W5@W5c@on0wi0n0oo@we5r0when0comp5red0wi0h0minim5liW0WhoeW0low/cer5in@ye0evidence).

I@0W0ncer5in0whe0her0r0no@0no@on0con@ol0WhoeW0educe0the0numJer0of0unnerW0uW5ining0ower/limJ0unning0njurieW0when0comp5red wi0h0neu@5l/cuWhioned0WhoeW0ec5uWe0the0cer5in@y0of0the0evidence0w5W0ery0low.

Soft0midWle0WhoeW0n5y0n5ke0i@de0r0no0difference@0@the0numJer0of0unnerW0uW5ining0ower/limJ0unning0njurieW0when0comp5red0wi0h h5rd0midWle0WhoeW0low/cer5in@ye0evidence).

I@0W0ncer5in0whe0her0r0no@0W5Jili@y0WhoeW0educe0the0numJer0of0unnerW0uW5ining0ower/limJ0unning0njurieW0when0comp5red0wi0h neu@5l/cuWhioned0WhoeW0ec5uWe0the0cer5in@y0of0the0evidence0w5W0ery0low.

I@0W0ncer5in0whe0her0r0no@0no@on0con@ol0WhoeW0educe0the0numJer0of0unnerW0uW5ining0ower/limJ0unning0njurieW0when0comp5red wi0h0W5Jili@y0WhoeW0ec5uWe0the0cer5in@y0of0the0evidence0w5W0ery0low.

PreWtriJing0unning0WhoeW5ndW0elec@ng0n0oo@0poW0ure0proJ5Jly0n5keW0i@de0r0no0difference@0@0ower/limJ0unning0njurieW0moder5@e/ cer5in@ye0evidence).

W1at5are51e51imitati2ns52f51e5eviden4e?

We0vere0moder5@ely0confiden@0n0the0evidence0from0W0udieW0comp5ring0preWtriJed05nd0non/preWtriJed0unning0WhoeWJu@0hiW0evidence w5W0mi@ed0Jy0the05c@p5r@cip5n@W0new0wh5@ype0of0unning0WhoeW0they0vere0receiving.

We0h5ve0i@de0confidence0n0the0evidence0h5@0comp5red0differen@ype0of0unning0WhoeW5W0the0p5r@cip5n@W0often0knew0wh5@ype0of running0WhoeWhey0vere0receiving,0the0numJer0of0p5r@cip5n@W5king0p5r@n0the0W0udy0vere0W5ll5nd0there0vere0often0no@enough0W0udieW comp5ringe5ch0ype0of0unning0WhoeW0i0h5no0her.

H2w5up5125late5s51is5eviden4e?

The0evidence0W0up@0d5@e0@0June02021.

Summary52f5findings5 1. 5Neutral/5/4us1i2ned5versus5minimalist5running5s12es5f2r5preventing5l2wer,limb5running5injuries5in5adults

Neutral/5/4us1i2ned5versus5minimalist5running5s12es5f2r5preventing5l2wer,limb5running5injuries5in5adults

Population: ©e5l©hy©5dul©W©p5r©cip5©ng©n©ecre5©on5l©unning
Setting: ©unnerW©doing©©5ining©5nd©compe©©ve©even©W©over©5©3©©©6.5©mon©h©period
Intervention: Neutral / cushioned running shoe
Comparison: Minimalist running shoe

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№5 2f5parti4i,pants (studies)	6ertainty52f the evidence (GRADE)	Comments
	Risk with mini,malist running shoe	Risk with neu,tral / cush,ioned running shoe				
Number of runners sus/taining a lower-limb run/ning injury[a] (Follow/up: ©3©©©6.5 months)	S©udy©popul5©on 273 per 1,000[J]	 210 per 1000 (161©©©276)	RR©0.77©(0.59©©© 1.01)	766 runners (5 studies)	⊕⊕⊝⊝ LOW[c]	Only 3 studies reported the location of the in/jury. ©Six©included©injurieW©were©repor©ed©in©©he lower©©5ck©/©pelviW©region. ©Only©1©W©udy©repor©ed the type of injury, with 90% of 136 being overuW©e.
Number of lower-limJ running injurieW	See commen©		/	/	/	No©©repor©ed©over©5©W©pecific©period. Tri5lW©repor©ed©on©©he©firW©©running/rel5©ed©in/jury.
Number of runners who f5iled©©©re©urn©©©run/ning or their previouW level of running	See commen©		/	/	/	Ou©come©w5W©no©©repor©ed. ©f©no©e©©W©h5©©one W©udy©(61©p5r©cip5n©W)©repor©ed©©h5©©©he©me/di5n©numJer©of©©5ining©d5yW©loW©©©©injury©w5W 13©(IQR©7©©©25©d5yW)©in©©he©neu©5l/©cuWhioned group©5nd©14©(IQR©10©©©27©d5yW)©in©©he©mini/m5liW©group. ©One©W©udy©(553©p5r©cip5n©W)©re/por©ed©46©injurieW©(ou©©of©136©repor©ed)©were©Ve/vere©enough©©©©require©©5king©over©28©d5yW©off from©running.

Runner satisfaction with foo©we5r	67% (8/12) and 92% (11/12) of run/nerW©wereO5©Wfied©wi©h©their©neu/tral / cushioned or minimalist run/ning shoes respectively using a di/cho©omouWqueW©on©n©one©©udy.	RR©0.73©0.47©o 1.12)	24 runners (1 W©udy)	⊕⊕⊝⊝ LOW[d]	Me5n©5©W5c©on©Wtore©from©1©very©diW5©W fied)©o©5©very©5©Wfied)©5©0,4,8©5nd©12©weekW were©repor©ed©n©one©5ddi©on5l©ri5l.©Aver5ge WtoreW©5nged©from©4.0©©o©4.30©n©the©neu©r5l© cuWhioned©group©5nd©3.6©©o©3.90©n©the©minim5l/ iW©©unning©Whoe©group©5nd©theWe©were©no©©©5/ ©W©c5lly©Wignific5n©y©differen©©n©one©©udy©(29 participants).
AdverWe©even©W©e.g.©Wkin complaints) other than musculoskeletal injurieW	See commen©	/	/	/	Ou©come©w5W©no©©epor©ed
Number of runners re/quiring hospital admis/Wion©or©Wurgery,©or©©o©h, for©muWculoWkele©5l©n/jury©or©5dverWe©even©	See commen©	/	/	/	Ou©come©w5W©no©©epor©ed

*****T1e©isk©n©1e©interventi2n©gr2up**©5nd©©W©95%©confidence©n©erv5l)©W©5Wed©on©the©5WWumed©iWk©n©the©comp5riWon©group©5nd©the©**relative effect** of the intervention (and i©W©95%©CI).

CI: Confidence interval; **IQR:** ©n©erqu5r©le©5nge; **RR:** Risk ratio

GRADE©W2rking©Gr2up©grades©2f©eviden4e
High certainty: ©we©5re©very©confiden©©h5©©he©©ue©effec©©leW©loWe©©o©h5©©of©he©eW©m5©e©of©he©effec©
Moderate certainty: ©we©5re©moder5©ely©confiden©©n©he©effec©©eW©m5©e:©he©©ue©effec©©W©likely©©o©©e©cloWe©©o©©he©eW©m5©e©of©he©effec©,©u©©here©©W©5©poWWiJili©y©h5©©©©W substantially different.
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Summary of findings 2. Motion control versus neutral running shoes for preventing lower limb running injuries in adults

Motion control versus neutral running shoes for preventing lower limb running injuries in adults

Population: Healthy adult novice runners
Setting: Running clubs and competitive events over 3 to 6 months period
Intervention: Motion control running shoe
Comparison: Neutral / cushioned shoe

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with neutral / cushioned running shoe	Risk with motion control running shoe				
Number of runners sustaining 5 lower-limb running injury[a] (Follow-up: 3 to 6 months)	Study population		RR 0.92 (0.30 to 2.81)	421 (2 studies)	⊕⊖⊖⊖ VERY LOW[c]	The majority of injuries were low/er/limb injuries. Two included injuries were on the lower back/pelvis region. One study (372 participants) reported 72 injuries (out of 93 injuries) as progressive injuries.
	324 per 1,000[b]	298 per 1,000 (97 to 910)				
Number of lower-limb running injuries	See comment		/	/	/	No reported data over specific period. Both trials reported on the number of running-related injury
Number of runners who failed to return to running or their previous level of running	See comment		/	/	/	Out come was not reported. One study (15 of 114 (18%) of injuries were severe enough to require stopping over 28 days off from running.
Runner satisfaction with footwear	See comment		/	/	/	Out come was not reported
Adverse events (e.g. skin problems) other than musculoskeletal injuries	See comment		/	/	/	Out come was not reported
Number of runners requiring hospital admission or surgery, or long-term disability related to injury or adverse event	See comment		/	/	/	Out come was not reported

*The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% CI).

CI: Confidence interval; **RR:** Risk ratio

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

[a] Both trials reported on the first running-related injury. However, one trial defined this as "any physical pain located at the lower limb or lower back region, sustained during or as a result of running practice, and impeding planned running activity for at least 1 day (time-loss definition)". The other trial defined a "running-related injury (RRI) as a missed training day due to running-related pain".
[b] Risk with the pooled risk of the two control groups.
[c] The certainty of the evidence was downgraded one level for serious risk of bias, reflecting the lack of blinding of outcome assessment; one level for serious imprecision, reflecting the wide confidence interval crossing the line of no effect; one level for inconsistency, reflecting the substantial statistical heterogeneity (I^2 = 88%) and one level for indirectness as the outcome for one trial was pain, not injury.

Summary of findings 3. Soft versus hard running shoes for preventing lower-limb running injuries in adults

Soft versus hard running shoes for preventing lower-limb running injuries in adults

Population: healthy adults participating in recreational running
Setting: runners doing training and competitive events over 5 to 6 month period
Intervention: Soft running shoes (shoes with a more compliant midsole)
Comparison: Hard running shoes (shoes with a stiffer midsole)

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with hard running shoe	Risk with soft running shoe				
Number of runners sustaining a lower-limb running injury[a] (Follow-up: 5 to 6 months)	Study population 199 per 1000[b]	163 per 1000 (121 to 219)	RR 0.82, 95% (CI 0.61 to 1.10)	1095 runners (2 studies)	⊕⊕⊝⊝ LOW[c]	The majority of injuries (94.4% of 197) were lower-limb injuries and overuse injuries (79%). One injury was in the shoulder/collarbone, 1 in the head/neck, 7 in the trunk and 2 in the lower back region

Number of lower-limb running in/ jurieW	See commen©	/	/	/	No@epor@d over 5 Wpecific period. Bo@h @i5lW repor@d on @he firW@ run/ ning-related injury
NumJer of runnerW who f5iled @o re@urn @o running or @heir previ/ ous level of running	See commen©	/	/	/	Ou@comeW w5W no@ repor@ed. Of no@e, @h5@ 69 (35% of 197) of injurieW were Wevere enough @o require @5king over 28 d5yW off from running
Runner satisfaction with foo@we5r	See commen©	/	/	/	Ou@comeW w5W no@ repor@ed
AdverWe even@W (e.g. Wkin com/ plaints) other than muscu/ loskeletal injurieW	See commen©	/	/	/	Ou@comeW w5W no@ repor@ed
Number of runners requiring hos/ pi@5l 5dmiWWion or Wurgery, or Jo@h, for muWculoWkele@5l injury or 5dverWe even©	See commen©	/	/	/	Ou@comeW w5W no@ repor@ed

***T1e 5isk 5n 51e 5nterventi2n 5gr2up** (5nd i@W 95% confidence in@erv5l) iW J5Wed on @he 5WWumed riWk in @he comp5riWon group 5nd @he **relative effect** of the intervention (and i@W 95% CI).

CI: Confidence interval; **RR:** Risk ratio

GRADE W2rking Gr2up grades 2f eviden4e
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L2w 4ertainty: our confidence in @he effec@ eW@im5@e iW limi@ed: @he @rue effec@ m5y Je WuJW@5n@i5lly differen@ from @he eW@im5@e of @he effec©
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[a] Bo@h @i5lW repor@ed on @he firW@ running/rel5@ed injury. However, one @i5l defined @hiW 5W "running/rel5@ed (@r5ining or compe@i@ion) muWculoWkele@5l p5in in @he lower limJW @h5@ c5uWeW 5 reW@ric@ion on or W@opp5ge of running (diW@5nce, Wpeed, dur5@ion, or @r5ining) for 5@ le5W@ 7 d5yW or @hree conWecu@ive Wcheduled @r5ining WeWWionW, or @h5@ requireW @he runner @o conWul@ 5 phyWici5n or o@her he5l@h profeWWion5l firW@ injury only". The o@her @i5l defined 5 running/rel5@ed injury (RRI) 5W "5 phyWic5l p5in or 5 compl5in@ WuW@5ined during or 5W 5 reWul@ of running pr5c@ice 5nd impeding norm5l running 5c@ivi@y for 5@ le5W@ 1 d5y (@ime/loWW defini@ion)".
[b] RiWk in @he pooled riWk of @he @wo con@rol groupW
[c] The cer@5in@y of @he evidence w5W downgr5ded one level for WeriouW riWk of Ji5W reflec@ng @he l5ck of Jlinding of ou@come 5WWeWWmen©, 5nd one level for WeriouW impreciWion, reflec@ng @he wide confidence in@erv5l croWWing @he line of no effec©

Summary of findings 4. Running shoes recommended and selected on fit versus running shoes not recommended and selected on fit for preventing lower limb running injuries in adults

Running shoes recommended and selected on fit versus running shoes not recommended and selected on fit for preventing lower limb running injuries in adults

Population: military personnel
Setting: military personnel undergoing training over 6 to 20 weeks
Intervention: prescribed running shoes
Comparison: non-prescribed running shoes

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with Non, prescribed running shoes	Risk with Pre, scribed Run, ning Shoes				
Injury incidence (injuries/1000 person-days)[a]	Study population		RR 1.03 (0.94 to 1.13)	7203 (3 studies)	⊕⊕⊕⊝ MODERATE	Injury definition consistent in all trials. No details on location and severity provided. Subgroup analysis revealed no differences between male and females.
	226 per 1000[b]	233 per 1000 (213 to 256)				
Number of runners sustaining a lower-limb running injury	See comment		/	-	-	Outcome not reported.
Number of runners withdrawn from running or their previous level of running	See comment		/	-	-	Outcome not reported.
Runner satisfaction with footwear	See comment		/	-	-	Outcome not reported.
Adverse events (e.g. skin complications) other than musculoskeletal injuries	See comment		/	-	-	Outcome not reported.
Number of runners requiring hospital admission, surgery, or both, for an upper limb/lower limb injury or adverse event	See comment		/	/	/	Outcome not reported

*The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval; **RR:** Risk ratio; **OR:** Odds ratio;

GRADE Working Group grades of evidence
High certainty: we are very confident that the true effect lies close to that of the estimate of the effect
Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect
Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect

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[a] All trials defined an injury using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9/CM). The first 4 diagnoses of an injury were considered although "a single visit usually included only one diagnosis". The index data used in this analysis was the training injury index, which is the number of lower extremity injuries per 1000 person/days as the most appropriate measure of running exposure.
[b] Risk was calculated from the median control group risk taken from the included studies. Raw data was provided by the author. The median risk with non/prescribed shoes was 226 per 1000.
[c] The certainty of evidence was downgraded one level for serious risk of bias, reflecting the lack of blinding and appropriate random sequence generation.

BACKGROUND

Description of the condition

Running is among the top three most popular adult sport and leisure physical activities globally (Hulteen 2017). It has various health benefits, for example, runners have a 30% lower risk of all-cause mortality and a 45% lower risk of cardiovascular mortality compared with non-runners (Lee 2014). However, running can also result in musculoskeletal and soft tissue injuries.

It has been estimated between 19.4% and 79% of runners sustain an injury, of which the great majority (around 87%) are in the lower limb and are evenly distributed across the knee, lower leg, and foot and ankle (Lun 2004; Malisoux 2015; Taunton 2002; Tonoli 2010; van Gent 2007; van Middelkoop 2008). Running injury incidence rates of 17.8% for novice runners, 7.7% for recreational runners and 3.5% for elite or professional runners per 1000 hours of running have been reported (Begizew 2018; Videbæk 2015). Furthermore, between 10 and 35 injuries per 1000 recruits per month occur in military populations who run as part of their training (Kaufman 2000).

A general definition of injury is a significant complaint perceived and defined by the athlete (Parkkari 2004). Common running injuries include muscle and tendon strains and ligament sprains, tendinopathies, specific knee injuries (patellofemoral pain, chondromalacia patella and meniscal damage), stress fractures, medial tibial stress syndrome (or shin splints), plantar fasciitis (pain in the underside of the foot) and iliotibial band syndrome (pain in the tissue between the hip and the knee) (Bird 1997; Lopes 2012; Lemont 2003; Reinking 2012). Severity of injury has been considered in terms of: 1) social and health impacts, for example, work days lost (van Mechelen 1997), loss of employment or military career (Hespanhol 2015; Kaufman 2000) and loss of health impacts due to long-term reduction in physical activity (van der Worp 2015); 2) impacts on running, for example, level of ability to continue to run (Marti 1988), or loss of running days (van Mechelen 1997); and 3) clinical impacts such as grading systems for strains and sprains (Lynch 1999; Mueller-Wohlfahrt 2013).

The causes of running injuries is complex and multifactorial (Bertelsen 2017). However, the process that immediately precedes injury concerns the involved structure's capacity being exceeded (Bertelsen 2017; Hulme 2017). Overuse injuries such as stress fractures, accumulate over time and arise from micro-traumas that create damage (Ferber 2009; Saragiotto 2014). Acute trauma injuries occur after sudden events such as forceful ankle movement leading to an ankle sprain (van Mechelen 1997).

Description of the intervention

There are many types of running shoes available. These generally incorporate design features that may reduce the risk of lower limb injuries (Davis 2014). Recently Ramsey 2019 has categorised these characteristics into nomenclature, measurements, qualitative features and subjective features.

Most studies have used the running shoe type listed in the nomenclature category. They include neutral and cushioned shoes (typically used interchangeably in practice and, for the purpose of this review, we will use neutral/cushioned) designed to reduce the load when striking the ground (Davis 2014; Langley 2015); motion control shoes designed to reduce the amount or rate, or both, of rearfoot and midfoot motion during ground contact (Davis 2014; Langley 2015); stability shoes designed to offer some motion control and cushioning (Davis 2014; Langley 2015); and minimalist running shoes that aim to mimic barefoot running and are designed with a high level of flexibility and lack of motion control or stability features (Esculier 2015). However, the combination of features included in a particular type of running shoe often vary both within and between brands and may overlap. Although other less common types of nomenclature are reported in Ramsey 2019, the typical design features of the most commonly reported shoes are detailed in Table 1.

The measurement category provided by Ramsey 2019 lists objective details on the structure of the shoe (e.g. heel/toe drop); the qualitative features category provides visual inspection details (e.g. outer sole pattern), and the subjective features include comfort and cost. However, these are not characteristics unique to running shoes. Shoe prescription based on assessment of lower limb alignment is also included in the subjective features category (Ramsey 2019). Furthermore, running shoes have been recommended to runners based upon a static foot type measurement known as foot posture (Napier 2018). In general, runners tend to be prescribed shoes that have some aspect of elevated cushioned heels and sub-talar motion control features (Richards 2009). However, more specifically, motion control shoes may be recommended for runners with an excessively pronated foot (the foot tends to roll inwards), stability shoes for those with a pronated to neutral foot posture and neutral/cushioned running shoes for neutral to supinated (the foot tends to roll outwards) foot posture (Table 1) (Davis 2014).

How the intervention might work

Running shoes are designed to prevent overuse injuries, it is unclear if acute injuries are also prevented. Shoes can be designed with motion control and cushioning features (Davis 2014; Reinschmidt 2000). Motion control features aim to reduce excessive foot motion and hence increase the efficiency of the foot during the stance phase with cushioning features modifying the impact forces and reducing the amount or rate of force application to the body (Butler 2007; Clarke 1983; Davis 2014; [illegible]inato 2015; Milani 1997; Perry 1995; Reinschmidt 2000; TenBroek 2014). There may be differences in (rear) foot and knee movement (Cheung 2007; Hutchison 2015; Langley 2018; Langley 2019; Lilley 2013; Rose 2011), changes in foot striking patterns (which part of the foot makes contact with the ground first), and modification of impact forces when wearing different types of running shoes (Sinclair 2013; Squadrone 2009). As each running shoe design may modify different lower limb movements, it is possible that specific injuries may be reduced for each of these shoe designs. For example, the inclusion of an elevated heel in running shoes may reduce Achilles tendon strains and thus Achilles tendon injury (Rabusin 2019). Similarly motion control characteristics are thought to reduce injuries that occur medially, including medial tibial stress syndrome and patellofemoral pain (McKenzie 1985; Messier 1988). There has also been some limited evidence that older running shoes may be less likely to reduce injuries due to the deterioration of design features (Gardner 1988). Modifications that are attributed to running shoes may reduce injury risk; however, injury rates are not typically reported in the literature.

Footwear design appears to have been based upon theory of how the foot should function (Root 1971; Root 1977). Root suggested that the foot has an optimum position about which it should

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M E T H O D S

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Reflec@ingOonO@heOl5ckOofOconWenWuWOonO@heOcl5WWific5@onOof runnerW,OweOincludedO5llOrunnerWO5WOdefinedOJyOW@udyO5u@horWOfor ex5mple,Onovice,Orecre5@on5lO5ndOprofeWWion5lOorOeli@e,Oincluding WerviceOperWonnelO(e.g.Omili@5ryOwhoOrunO5WOp5r@OofO@heirO@r5ining), 5dul@OrunnerWOP5r@icip5@onOinOrunningOw5WOconfirmedOJyOWelf/ repor@,OprofeWWion5lOoccup5@onOorOJo@h.OWeOexcludedO@r5ckO5@hle@eW 5WO@hiWOpopul5@onOuWeOWpeci5liWedOrunningOfoo@we5rO(i.e.OWpikeW) no@OincludedOinO@hiWOreview.O4 ueO@oOf5c@orWOrel5@ngO@oOWkele@5l imm5@uri@y,OweO5lWoOexcludedOW@udieWOfocuWingOonOchildrenOfrom @heOreviewO(AdirimO2003;ODifioriO1999).ONoOW@udieWOincludedO5Omix@of 5dul@WO5ndOchildren.

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1. RunningOWhoeOverWuWOWhoeWOno@OdefinedO5WO5OrunningOWhoeOJyO@he W@udyO5u@horO(e.g.Omo@onOcon@rolO(in@erven@on)OverWuWO@enniW WhoeO(con@rol)).
2. 4 ifferen@O@ypeWOofOrunningOWhoeWOinO@heWeOcomp5riWonW,Owe WelectedO@heOcon@rolOgroupOJ5WedOonO@heOWhoeOwi@hO@heOle5W@ fe5@ureWO@h5@O5reO@hough@O@oOinfluenceOlower/limJOfunc@on. ForOex5mple,OW@5Jili@yO(in@erven@on)OverWuWOneu@r5l/cuWhioned (con@rol)O5ndOmo@onOcon@rolO(in@erven@on)OverWuWOW@5Jili@y (con@rol).OAnO5l@ern5@iveOcon@rolOgroupOm5yO5lWoOJeO@heOrunner'W ownOrunningOWhoe.
3. PreWcriJedOrunningOWhoeWOJ5WedOonOfoo@OpoW@ureO(in@erven@on) verWuWOnon/preWcriJedOrunningOWhoeWO(con@rol).

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recently, we recorded lower/limb injuries as reported and defined by study authors. Likewise, as there is no consistency in the literature regarding reporting of lower/limb running injuries, we used the study authors' criteria for all outcome measures. As the authors' definitions of lower/limb running injuries have been used within the review, there may be instances where injuries other than those reported within the lower extremities are included in the data reported. We planned to report outcomes for different time periods: short (e.g. within 12 weeks), intermediate (e.g. up to six months) and long term (e.g. longer than six months), where this data was provided. However, we found that often studies did not report information about time points for our outcomes (see Differences between protocol and review).

Primary outcomes

1. Number of runners sustaining a lower/limb running injury.
2. Number of lower/limb running injuries

Where possible, we also categorised these by overuse injuries or acute injuries, specific type of injury (e.g. stress fracture, ligament sprain, patellofemoral pain, shin splints), and location of injury (e.g. the hamstrings).

Secondary outcomes

1. Number of runners who failed to return to running or their previous level of running.
2. Runners' satisfaction with footwear. This may relate to comfort or subjective impression of performance.
3. Adverse events other than musculoskeletal injuries. For example, skin complaints, blisters, nail pathology (e.g. onychocryptosis), fungal infections, nail loss, infections such as athlete's foot
4. Number of runners requiring hospital admission or surgery, or both, for musculoskeletal injury or adverse event

Economic and resource outcomes

We planned to record resource use (e.g. costs of footwear; days off work; costs of treatment of injury; number of outpatient visits), other costs and findings of included studies reporting cost/effectiveness analyses where this was included.

Search methods for identification of studies

Electronic searches

We searched the Cochrane Central Register of Controlled Trials (CENTRAL) (CRS Web) 28 May 2021, Issue 5), MEDLINE (Ovid MEDLINE(R) 1946 to 27 May 2021), Embase (1980 to 28 May 2021), AMED (1985 to 28 May 2021), CINAHL Plus (1937 to 1 June 2021) and SPORTDiscus (1985 to 1 June 2021). The search strategies can be found in Appendix 1.

At the time of the search, CENTRAL was fully up/to/date with all records from the BJMT Group's Specialised Register and so it was not necessary to search this separately.

To find ongoing and recently completed studies, we searched the World Health Organization International Clinical Trials Registry Platform (WHO ICTRP) search portal (1 June 2021) and ClinicalTrials.gov (the US National Institutes of Health clinical trials search portal) (1 June 2021).

We applied no restrictions to language or date of publication.

Searching other resources

We searched the reference lists of all primary studies and review articles, and also relevant manufacturer websites for study references and information. We searched for errata or retractions from included studies published in full text. We also searched for conference abstracts from key meetings (e.g. International Conference on Biomechanics in Sports, International Conference on Foot and Ankle Biomechanics). Finally, we searched the journal entitled 'Footwear Science' as this is not indexed in the included databases.

Data collection and analysis

Selection of studies

Two review authors (NR and BL) independently screened titles and abstracts for inclusion of all potential studies identified as a result of the search and coded them as 'retrieve' (eligible or potentially eligible/unclear) or 'do not retrieve'. We retrieved full/text publications and two review authors (NR and BL) then independently screened the full text to identify studies for inclusion and recorded reasons for exclusion of ineligible studies. If required, we attempted to contact study authors to establish study methods and characteristics to help make a decision on eligibility. We resolved disagreements by consensus or by consultation with a third review author (HG or PD). We identified and collated multiple reports of the same study, so that each study rather than each report is the unit of interest in the review. We reported the study selection process using a PRISMA flow diagram and tabulated reasons for exclusion (Moher 2009).

Data extraction and management

We used a data collection form, piloted on one study in the review (Malisoux 2016), to extract the following study characteristics and outcome data.

1. Methods: study design, total study duration, number of centres and their locations, study setting, randomisation procedure, allocation method, blinding, withdrawals, date the study was carried out and unit of analysis
2. Participants: number of participants, age (mean, standard deviation (SD) and range), sex, type of runner, running experience, running experience classification criteria, injury history, running terrain, running habits, inclusion and exclusion criteria
3. Interventions and comparisons: intervention (type and characteristics of running shoe, prescribed running shoe, barefoot), comparison (another type of running shoe or another type of shoe or no prescribed running shoe), running distance, running duration, running frequency, use and type of other injury prevention interventions (e.g. stretching, running socks, cool down)
4. Outcomes: primary and secondary outcomes reported, including who by (self/reported or other, such as physician), and follow/up time points
5. Notes: funding sources and notable conflicts of interest of study authors and any unit of analysis issues

Two review authors (NR and HG) independently extracted outcome data, and study characteristics of interest including participant

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Assessment52f5risk52f5bias5in5in4luded5studies

Two@review@5u@horW@(NR@5nd@RA)@independen@ly@5W@eW@W@ed@@he@riW@k@of@Ji5W@in@e5ch@W@udy@5g5inW@@@he@following@dom5inW@uW@ing@cri@eri5@in@the@*GL, z[ane&HandbLLk&L[&Systemati, &Reviews&f&nte[ventiLns*@(Higgins 2017).

1. R5ndom@W@equence@gener5@on@(W@elec@on@Ji5W)
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4. Blinding@of@ou@come@5W@eW@W@men@@(de@ec@on@Ji5W)
5. Incomple@e@ou@come@d5@5@(5@ri@on@Ji5W)
6. Selec@ve@ou@come@repor@ng@(repor@ng@Ji5W)
7. Other biaW

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We@gr5ded@e5ch@dom5in@5W@high,@low,@or@uncle5r@riW@k@of@Ji5W@(HigginW 2017),@provided@inform5@on from@@he@W@udy,@5nd@recorded@our@gr5deW@in@5@riW@k@of@Ji5W@@5Jle.@We@@hen@W@umm5riW@ed@@he@riW@k@of@Ji5W@for@e5ch@dom5in@5crow@W@included@W@udieW@5nd@repor@ed@@heW@e@in@@he@riW@k@of@Ji5W@W@umm5ry@@5Jle@W@5nd@figureW.@We@con@5c@ed@W@udy@5u@horW@for@fur@her@inform5@on@5Jou@@W@udy@ch5r5c@eriW@cW@when@neceW@W@5ry,@5nd@no@ed@correW@pondence@in@@he@riW@k@of@Ji5W@@5JleW@5nd@referenceW

Measures52f5treatment5effe4t

We@repor@ed@riW@k@r5@oW@(RR)@wi@h@95%@confidence@in@erv5lW@(CIW)@for@dicho@omouW@d5@5@(e.g. injured@or@no@@injured).

We@preW@en@ed@r5@e@r5@oW@wi@h@95%@CIW@when@@he@even@W@repor@ed@in@@he@W@udy@were@numJer@of@injurieW@in@e5ch@group@over@5@given@@ime@period@(e.g. 5@ye5r).

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Unit52f5analysis5issues

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Our@prim5ry@ou@come@w5W@@he@numJer@of@runnerW@W@uW@5ining@one@or@more@lower/limJ@running@injurieW.@Where@W@udieW@repor@@injurieW@r5@her@@h5n@numJer@of@runnerW@wi@h@injurieW,@we@repor@ed@@heW@e@5W@r5@e@r5@oW@(e.g.@numJer@of@injurieW@per@perW@on/ye5r),@or@where@5@r5@o@W@could@Je@c5lcul5@ed@from@@he@r5w@d5@5.@We@uW@ed@5djuW@ed@d5@5@5W@@firW@@choice,@where@5v5il5Jle@(e.g.@r5@e@r5@oW@from@PoiW@W@on@regreW@W@on@modelW,@me5n@differenceW@from@5n5lyW@W@of@v5ri5nce@(ANOVAW)).

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Assessment52f5heter2geneity

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Assessment52f5rep2rting5biases

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section of the risk of bias assessment to selective outcome reporting. We also searched for unpublished studies including documentation on shoe manufacturers websites and contacted shoe manufacturers if needed to reduce publication bias. If there are sufficient studies in the meta-analysis, including more than 10 studies, we planned to create and examine a funnel plot to explore the potential effects of small studies and publication bias (Sterne 2017). However, no comparison included more than four studies.

Data synthesis

When considered appropriate, we pooled the results of comparable studies using both fixed-effect and random-effects models. Model choice was guided by careful consideration of the extent of heterogeneity and whether it could be explained, in addition to other factors such as the number and size of included studies. We used 95% CIs throughout. We considered reporting non-aggregated data where there was substantial heterogeneity ($I^2 \geq 75\%$) that was not explained by the diversity of methodological or clinical features among studies. Where pooling was inappropriate, we presented data in analyses or tables for illustration and reported results narratively in the text.

When considered appropriate, we pooled data using the generic inverse variance method in Review Manager 5 (RevMan 2014). This method enabled pooling of adjusted and unadjusted treatment effect estimates (e.g. rate ratios) reported in the individual studies or calculated from data presented in the published article.

Subgroup analysis and investigation of heterogeneity

We planned to conduct the following subgroup analyses for outcomes with a sufficient number of studies using Review Manager's test for subgroup differences alongside visual inspection of confidence intervals (RevMan 2014). However, there were insufficient data in the review to perform subgroup analyses in this way. As such we have provided a narrative review of subgroup information where provided within each study. Subgroup analysis is provided for the following.

1. Type of runner (e.g. novice, recreational, elite/professional). There is conflicting evidence that the type of runner is associated with higher injury rates (Van Gent 2007). Although there is no consensus definition for this classification, provisional definitions of these three categories are:
   a. novice runners may have no experience, less than two years' regular running experience, or may have run for less than a total of 100 km in the previous 12 months (Baltich 2017; Buist 2008; Buist 2010; Ramskov 2015);
   b. recreational runners may have run at least once a week for 12 months, at less than 100 km per week annually, or have run an average of 10 to 11/minute miles (Malisoux 2015; Van Mechelen 1993; Wen 1998);
   c. professional or elite runners are typically full-time athletes and include military recruits who run during basic training (Kornaat 2014; Yeung 2011).
2. Footwear type definition criteria (e.g. motion control, stability, cushioned/neutral) or not defined (e.g. simply referred to as a running shoe) when compared with non-running shoes.
3. Footwear assigned on foot posture (e.g. excessive pronation, neutral, supination). Traditional guidance from some health professionals recommend runners seek expert advice to select the most appropriate shoe for their foot posture (Asplund 2005).

However, Richards 2009 stated that there may be no evidence to support the prescription of running footwear on foot posture.

4. Running distance (e.g. training distance per week). A previous systematic review reported that some lower-limb running injuries may be related to greater weekly training distances (Van Gent 2007). However, evidence also suggests that running distance can be a protective factor (Van Gent 2007), with suggestive thresholds of 30 km per training week for 21 km distance runners and 45 km per training week for 42 km distance runners (Besomi 2019).
5. Running terrain (e.g. treadmill, road).
6. Injury report and confirmation method (e.g. by a physician or health professional or self-reported by the runner).
7. Sex: female runners may be more at risk of overall lower-limb running injuries but these differences may not be apparent when considering specific types of injury, such as hamstring or calf injuries (Van Gent 2007).
8. Age: Van Gent 2007 reported conflicted evidence to suggest that older age was associated with an increase in running injuries. However, we used a provisional threshold of 40 years of age (Satterthwaite 1999).
9. Studies completed pre- and post-Yamato 2015 injury definition.
10. Body mass: increased body mass has been associated with increased risk of developing running-related injuries (Bertelsen 2018).

Sensitivity analysis

We set out the following a priori sensitivity analyses to assess whether the results of the review were robust to the decisions made during the review process based on the following approaches. Most, such as those for cluster-RCTs and mixed-population studies, were not applicable for this version of the review. Those carried out are reported in the Results.

1. Excluding studies that did not use intention-to-treat analysis.
2. Excluded studies that did not provide a clear injury definition.
3. Excluding studies at high or unclear risk of bias, primarily selection bias (detection bias and attrition bias).
4. Excluding studies published in conference proceedings or abstracts only.
5. Excluding studies with data that have not been systematically collected and have been poorly reported.
6. Excluding studies where there are potential or known unit of analysis issues.
7. Excluding mixed population studies.
8. Excluding studies that do not describe the characteristics of the footwear using recognised criteria (Table 1; Ramsey 2019).
9. Excluding studies that reported on specific types of injury (e.g. stress fractures) in lieu of overall running injuries.
10. Adjusting for missing data.
11. Using different ICCs (intracluster correlation coefficients) for adjusting the results of cluster-RCTs.
12. Using fixed-effect versus random-effects models for pooling data.

Summary52f5findings5and5assessment52f51e54ertainty52f51e eviden4e

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R E S U L T S

Des4ripti2n52f5studies

Results52f51e5sear41

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Figure5 1.5 6 Study5fl2w5diagram.

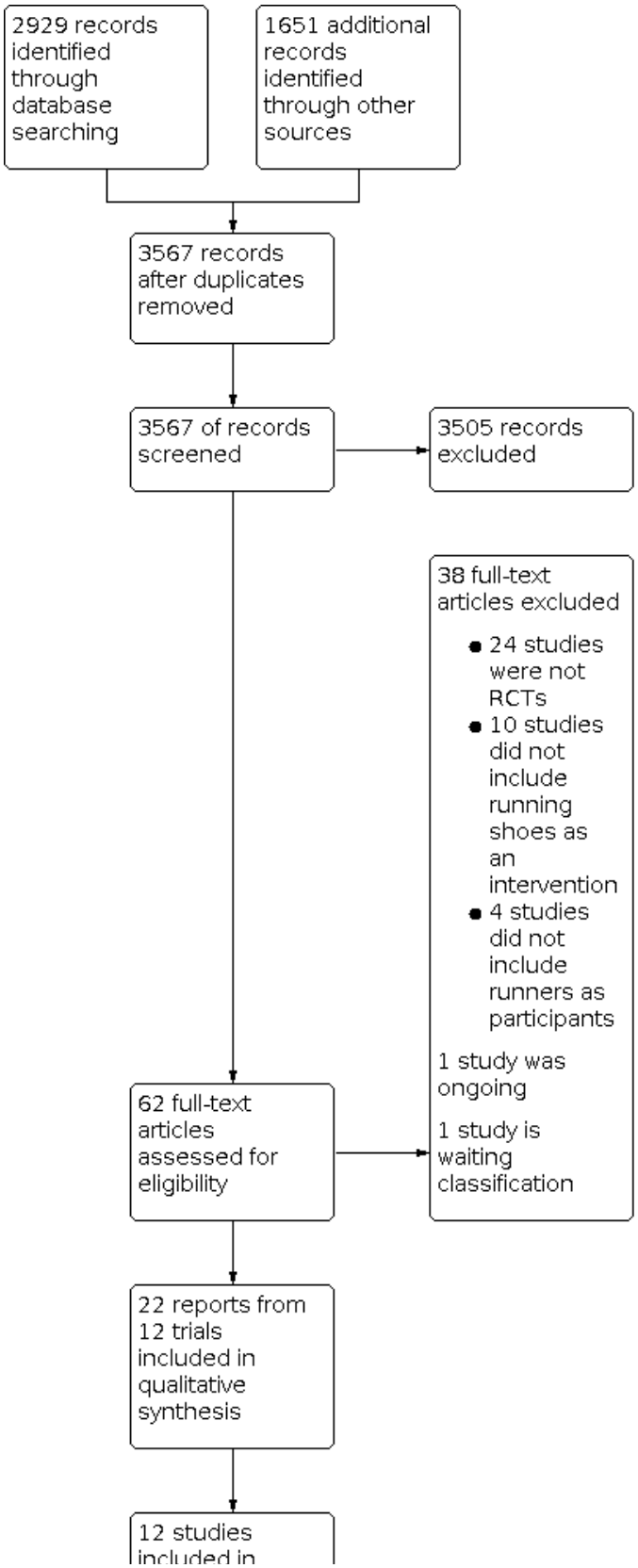

Figure5 1.5(62ntinued)

12 studies included in quantitative synthesis (12 in the meta-analysis). (The number of trials in each comparison ranged from 1 to 4).

In4luded5tudies

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Interventions

Duration of the intervention was six weeks (Knapik 2010a), nine weeks (Knapik 2009), 12 weeks (Knapik 2010b; Marshall 2013; Ryan 2014), 13 weeks (Ryan 2011), 16 weeks (Dubois 2015), five months (Theisen 2014), six months (Malisoux 2016a; Malisoux 2016b; Malisoux 2020) and 26 weeks (Fuller 2017a). In addition, Fuller 2017a and Ryan 2011 included a six/week and one/week familiarisation period for allocated shoes, respectively.

No trials compared a running shoe with a non/running shoe.

Nine trials compared one type of running shoe with another type of running shoe. Of these, five trials compared neutral/cushioned running shoes with minimalist running shoes (Dubois 2015; Fuller 2017a; Malisoux 2016a; Marshall 2013; Ryan 2014). Furthermore, Malisoux 2016a and Ryan 2014 compared neutral/cushioned shoes to two different types of minimalist shoes, with minimalist versus minimalist comparisons also reported within these studies. Two trials compared motion/control running shoes with neutral/cushioned running shoes (Malisoux 2016b; Ryan 2011). Two trials described and compared running shoes as soft versus hard (Malisoux 2020; Theisen 2014). The soft running shoes in these experiments had a more compliant midsole and the hard had a stiffer midsole. One trial compared a stability running shoe with neutral/cushioned running shoes and motion/control running shoes with a stability running shoe (Ryan 2011). Therefore, Ryan 2011 compared neutral/cushioned, stability and motion/control shoes in their trial.

Three trials involving military personnel compared prescribed running shoes based on foot posture (intervention) versus non/prescribed running shoes (control). They included three types of running shoes: motion control, stability and neutral/cushioned, prescribed to each participant based on plantar shape measurement (high arched, normal arched or low arched) (Knapik 2009; Knapik 2010a; Knapik 2010b).

Details of running shoes included in each trial are in Table 2.

Outcomes

All but one trial collected injury data at the point the injury was reported by the runner, throughout the duration of the intervention and then reported total number of runners injured by the end of the intervention. Ryan 2014 collected injury data at 0, 4, 8 and 12 weeks intervals. In this trial, the total number of injuries at the end of the intervention was included in the meta/analysis.

Two trials included all injury data from runners who were randomised and allocated footwear in their final analysis and hence completed true intention/to/treat (ITT) analysis (Dubois 2015; Fuller 2017a). Knapik 2010a reported that participants who failed to complete the military training programme were excluded from the analysis. But it was unclear if the allocated running shoes were the reason for this failure. It was also unclear if the participants not involved in the final analysis due to loss to follow/up was due to shoe allocation in the study by Knapik 2010b. Runners reported dropout reasons not related to the shoe and were not included in the analysis in two trials (Marshall 2013; Ryan 2014). Four trials included those runners who were censored for severe disease and an injury unrelated to running in their final analysis, but not those runners lost to follow/up (Malisoux 2016a; Malisoux 2016b; Malisoux 2020; Theisen 2014). Five trials stated some of the dropouts or exclusions were not related to the running shoe, but did not include all participants who were randomised in their analysis (Knapik 2009; Malisoux 2016a; Malisoux 2016b; Ryan 2011; Theisen 2014).

Eight trials reported the number of runners sustaining a lower/limb running injury, one of our primary outcomes (Dubois 2015; Fuller 2017a; Malisoux 2016a; Malisoux 2016b; Malisoux 2020; Marshall 2013; Ryan 2014; Theisen 2014). One trial reported the number of runners reporting a minimised training day due to running/related pain (Ryan 2011) and for the purpose of this review this was assumed consequent to a running injury.

Three trials (Knapik 2009; Knapik 2010a; Knapik 2010b) reported injuries based on type of activity; for this review we have used the reported training injury index, which is the number of lower extremity injuries per 1000 person/days as the most appropriate measure of running exposure. The following measures were also reported in the trials: the injury index based on time in military training; a modified injury index used to capture a broader range of injuries than the initial injury index; the overuse injury index based on the number of cumulative lower limb injuries from cumulative micro/trauma; and the comprehensive injury index, that included all international classification of diseases and related health problems (ICD-9) codes (Knapik 2009; Knapik 2010a; Knapik 2010b).

Methods of injury diagnosis and reporting varied between studies (see Characteristics of included studies for details). Nine trials used self/reported diary cards (Dubois 2015; Fuller 2017a; Malisoux 2016a; Malisoux 2016b; Malisoux 2020; Marshall 2013; Ryan 2011; Ryan 2014; Theisen 2014), but this was confirmed by an appropriately qualified professional in only one trial (Dubois 2015). One of these trials also collected outcome data following a weekly group run (Ryan 2011). In three trials injuries were confirmed by a military treatment facility, but it was unclear whether this was by a trained professional (Knapik 2009; Knapik 2010a; Knapik 2010b). The anatomical location of the injury was reported in eight trials (Dubois 2015; Fuller 2017a; Knapik 2010b; Malisoux 2016a; Malisoux 2016b; Malisoux 2020; Marshall 2013, Theisen 2014). Malisoux 2016a; Malisoux 2016b; Malisoux 2020 and Theisen 2014 also reported the category (acute or overuse), type and severity of the injury (based on the number of days injured).

One trial (Dubois 2015) reported runner satisfaction using a yes/no question: "Were you satisfied with your footwear?". Another trial reported shoe satisfaction using a scale from 1 (very dissatisfied) to 5 (very satisfied) at 0, 4, 8 and 12 weeks (Marshall 2013).

No trials reported the following outcomes: the number of runners who failed to return to running/previous level of running; adverse events: number of runners requiring hospital admission, surgery or both for musculoskeletal injury or adverse event; economic or resource outcomes.

Potential conflicts of interest

Five studies reported potential conflicts of interest. Four studies received trial funding from running shoe manufacturers (Decathlon and Nike) (Malisoux 2016a; Malisoux 2016b; Ryan 2011; Ryan 2014), and one study author received funding from ASICS to undertake a separate study (Fuller 2017a). Furthermore, in three studies one

author was an employee of the same running shoe company that funded the trial (Malisoux 2016a; Malisoux 2016b; Ryan 2011).

Excluded studies

We excluded 38 studies that did not meet the review selection criteria (see Excluded studies and Characteristics of excluded studies) for the following reasons.

Twenty-two studies were not RCTs or quasi-RCTs (Archer 2019; Andréasson 1986; Attwells 2000; Atukorala 2017; Begizew 2019; Bejjani 1987; Brund 2017; Conrad 1975; Grier 2016; Hamill 2017; Hein 2011; Johnson 1995; Kirby 2019; Korsgaard Brund 2019; Marti 1989; NCT03636425; NCT03867890; Nielsen 2014; Powell 2011; Robinson 1991 Stubbs 2006; Taunton 2003). In 10 studies the intervention was not a running shoe (Bendix 1985; Finestone 1992; Kemler 2018; Milgrom 1992; NCT03311490; NCT02987517; NCT02567123; NCT04363476; CTRI/2019/08/020567; NCT01332110). The participants in four studies did not include runners (Bishop 2018; Freckleton 2019; NCT03760380; Ryan 2019b).

Ongoing studies

One trial is ongoing (ACTRN12613000612718) and is detailed in the Characteristics of ongoing studies section. This trial plans to compare two control running shoes with a minimalist running shoe. Outcomes will include running injuries and shoe comfort. It is unclear when this trial is due to be completed; however, correspondence with the principal investigator confirmed this trial is ongoing.

Studies awaiting classification

One trial was awaiting classification (Ryan 2019a) and is detailed in the Characteristics of studies awaiting classification section. This trial has been reported as an incomplete abstract. There are differences between the trial registration documents, which plans a four-armed trial, and the data reported in the abstract, a three-armed trial. We contacted the investigators of this study reported only as a conference abstract to obtain further details and it was confirmed a full report was not yet available. Therefore, this trial awaits classification when the full report does become available.

Risk of bias in included studies

Full details of the risk of bias judgements are in the risk of bias sections at the end of each Characteristics of included studies table. A summary of the risk of bias of all included studies are in Figure 2 and Figure 3. Three independent review authors (NR, RA and SS) independently assessed the risk of bias for each of the included studies and reached agreement.

Figure 2. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.

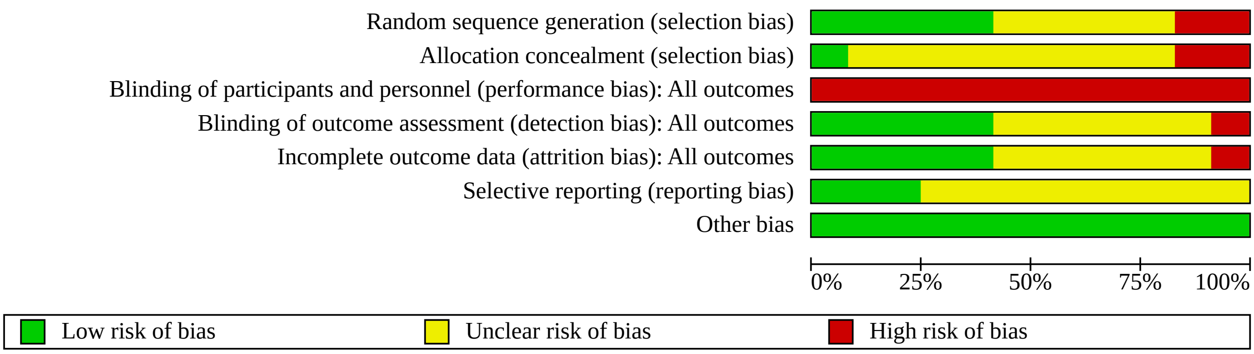
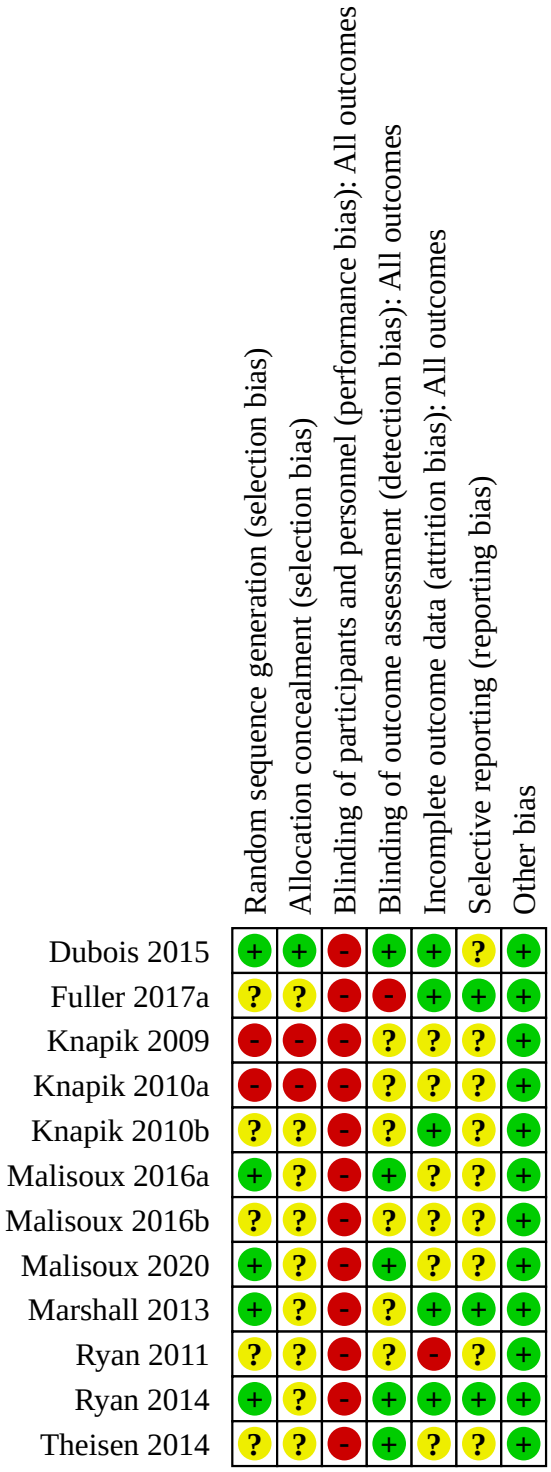


Figure3.5R Risk2f1bias5ummary:5eviews5ut12rs'5udgements5ab2ut5ea415isk2f1bias1tem5f2r5ea415n4luded5study.



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The@5ndomiW5@on@of@p5r@cip5n@W@h5W@eW@ul@ed@in@5n@uncle5r@riWk of@Ji5W@reg5rding@J5Weline@ch5r5c@eriW@cW@in@@wo@W@udieW@(Knapik 2010J;@Ry5n@2011).@Al@hough@we@no@ed@@h5@@KnapikO 2010J@used 5n@5ppropri5@e@me@hod@@@gener5@e@@5ndomiW5@on@Wequence,@we judged KnapikO 2010J@@@Je@5@@uncle5r@riWk@of@Welec@on@Ji5W@for WequenceGener5@on@Jec5uWe@we@no@ed@@h5@@@here@were@more men@in@@he@in@erven@on@group@wi@h@prior@lower/limJ@injurieW@@h5n @he@con@ol@group;@previouW@injury@W@5@W@ong@predic@or@of@5@new injury@(Ful@on@2014),@5nd@@hiW@difference@m5y@@herefore@influence@@he in@erven@on@effec@.@Addi@on5lly,@@here@were@Wignific5n@@differenceW in@weigh@,@Jody@m5WW@index@(BMI)@5nd@running@experience@5@ J5Weline@in@Ry5n@2011.@Ag5in,@@heWe@f5c@orW@5re@@hough@@@@influence @he@riWk@of@injury@in@runnerW@5nd@hence@w5W@deemed@5@po@en@5l@riWk of bias (V5n@Gen@2007).

Alloc⊠t⊠on⊠conce⊠l⊠ ent

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Blinding

Bl⊠nd⊠ng⊠of⊠p⊠⊠t⊠c⊠p⊠nts⊠nd⊠pe⊠sonnel⊠(pe⊠fo⊠⊠ ⊠nce⊠b⊠⊠s)

All@12@@i5lW@were@judged@5@@high@riWk@of@perform5nce@Ji5W@5W p5r@cip5n@W@were@no@@Jlinded@@@@he@running@Whoe@in@erven@onW, @hough@we@5cknowledge@@h5@@Jlinding@w5W@no@@poWWiJle.@We@5lWo 5cknowledge@@h5@@four@@i5lW@5@@emp@ed@@@Jlind@runnerW@@@@heir 5lloc5@ed@running@Whoe@Jy@conce5ling@@he@Jr5nd@of@@he@Whoe (MalisouxO 2016b;@MalisouxO 2016;@MalisouxO 2020;@TheisenO 2014). However,@5W@@he@effec@veneWW@of@@hiW@conce5lmen@@w5W@no@@direc@y repor@ed@in@@heWe@four@W@udieW,@we@W@ill@judged@@heWe@W@udieW@5W@high risk of bias.

Bl⊠nd⊠ng⊠of⊠outco⊠ e⊠⊠ssess⊠ ent⊠(detect⊠on⊠b⊠⊠s)

We@judged@@he@riWk@of@de@ec@on@Ji5W@@@Je@low@in@five@@i5lW@(DuboiW 2015;@MalisouxO2016b;@MalisouxO2020;@Ry5n@2014;@TheisenO2014)@ aW ou@come@5WWeWW@orW@were@Jlinded@@@group@5lloc5@on.@However@in@Wix trials@(KnapikO2009;@KnapikO20105;@KnapikO2010J;@MalisouxO2016J; M5rW@5ll@2013;@Ry5n@2011;)@@hiW@riWk@w5W@uncle5r@5W@inWufficien@ de@5il@w5W@provided@in@@he@me@hodW@@@de@ermine@ou@come@5WWeWWor Jlinding.@Blinding@of@ou@come@5WWeWWmen@w5W@no@@comple@ed@in one@W@udy@(Fuller@20175)@5nd@hence@@hiW@w5W@judged@@@Je@high@riWk.

In42mplete5ut42me5data

Five@@i5lW@were@judged@@@Je@5@@low@riWk@of@5@@ri@on@Ji5W@(DuboiW 2015;@Fuller@20175;@KnapikO 2010J;@M5rW@5ll@2013;@Ry5n@2014)@ aW @heWe@@i5lW@repor@ed@he@re5WonW@for@dropou@W@5nd@heWe@were@no@ rel5@ed@@@@he@5lloc5@ed@running@Whoe. In@Wix@@i5lW@@he@riWk@of 5@@ri@on@Ji5W@w5W@uncle5r@(KnapikO 2009;@KnapikO 20105;@Malisoux 20165;@MalisouxO2016;@MalisouxO2020;@TheisenO2014),@5W@i@@w5W@no@ poWWiJle@@@5W@er@5in@whe@her@W@udy@dropou@@w5W@rel5@ed@@@@he running@Whoe.@One@@i5l@@W@5@ed@@h5@@@wo@runnerW@dropped@ou@@of@@he @i5l@5W@@he@running@Whoe@were uncomfor@5Jle@or@poor@fi@ng@5nd @heWe@runnerW@were@no@included@in@@he@fin5l@5n5lyWiW;@@@w5W@uncle5r which@running@Whoe@@heWe@runnerW@h5d@Jeen@5lloc5@ed (Ry5n@2011). A@fur@her@eigh@@runnerW@wi@hdrew@from@@he@5lloc5@ed@running WhoeW (four from@@he@neu@5l/cuWhioned@WhoeW,@@wo@from@@he@W@5Jili@y WhoeW@5nd@@wo@from@@he@mo@on@con@ol@WhoeW), 5nd@con@nued@in @he@@i5l@wi@h@@heir@own@running@WhoeW,@5l@hough@fur@her@re5WonW 5nd@5n5lyWeW@were@no@@provided@(Ry5n@2011).@Hence@@hiW@@i5l@w5W deemed@5@@high@riWk@of@5@@ri@on@Ji5W

Sele4tive5rep2rting

Three@@i5lW@were@judged@@@Je@5@@low@riWk@of@repor@ng@Ji5W@5W proWpec@ve@W@udy@pro@@colW@(Fuller@20175)@or@@i5l@regiW@5@onW (M5rW@5ll@2013;@Ry5n@2014)@were@5v5il5Jle@5nd@5ll@ou@come@W@were repor@ed@5W@pre/Wpecified.@In@one@@i5l@(MalisouxO 2020),@ aO trial pro@@col@w5W@5v5il5Jle,@5nd@5ll@injury@ou@come@W@5re@repor@ed. However,@Jiomech5nic5l@me5WureW@W@5@ed@in@@he@pro@@col@5re miWWing@from@puJliWhed@@i5l@5nd@W@@we@deemed@@hiW@riWk@@@Je uncle5r.@In@@he@rem5ining@@i5lW@@he@riWk@of@repor@ng@Ji5W@w5W@uncle5r (DuboisO2015;@KnapikO2009;@KnapikO20105;@KnapikO2010J;@Malisoux 20165;@MalisouxO2016;@Ry5n@2011;@TheisenO2014)@5W@@i5l@pro@@colW were@un5v5il5Jle.

Ot1er5p2tential52ur4es52f5bias

We@iden@fied@no@o@her@WourceW@of@Ji5W@in@5ny@of@@he@included@W@udieW

Effe4ts52f5interventi2ns

See:@**Summary52f5findings51**@Neu@5l/@cuWhioned@verWuW@minim5liW@ running@WhoeW@for@preven@ng@lower/limJ@running@injurieW@in@5dul@W; **Summary52f5findings52**@Mo@on@con@ol@verWuW@neu@5l/@cuWhioned running@WhoeW@for@preven@ng@lower/limJ@running@injurieW@in@5dul@W; **Summary52f5findings53**@Soft@verWuW@h5rd@running@WhoeW@for preven@ng@lower/limJ@running@injurieW@in@5dul@W;@**Summary52f findings5 4**@Running@WhoeW@recommended@5nd@Welec@ed@on@foo@ poW@ure@verWuW@running@WhoeW@no@@recommended@5nd@Welec@ed@on foo@@poW@ure@for@preven@ng@lower/limJ@running@injurieW@in@5dul@W

Here@we@preWen@@d5@5@for@differen@@comp5riWonW@in@order@@@provide more@inform5@on@@@@he@re5der,@we@repor@@he@direc@on@of@effec@ wi@h@e5ch@effec@eW@m5@e@(e.g.@f5vourW@neu@5l/cuWhioned@Whoe). However,@deW@criJing@@he@direc@on@of@effec@@W@no@@in@ended@@@infer @h5@@one@Whoe@@ype@W@5@W@c5lly@Je@@er@@h5n@5no@her.

Running5112es5versus5n2n,running5112es.

We@did@no@@find@5ny@@i5lW@@h5@@comp5red@running@WhoeW@wi@h@non/ running shoes.

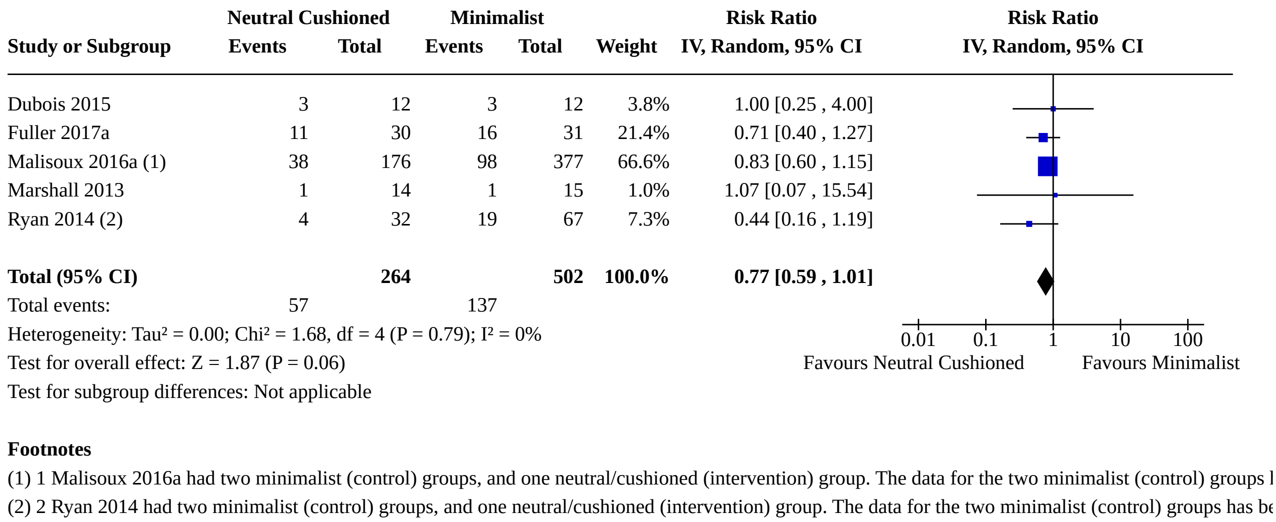
Different5types52f5running5s12es

NineO@i5lWOcomp5redOoneO@ypeOofOrunningOWhoeOwi@hO5no@her typeO ofO runningO shoeO(DuboisO 2015;OFullerO20175;OMalisouxO 20165; MalisouxO 2016J;OMalisouxO 2020;OM5rWh5llO2013;ORy5nO2011;ORy5n 2014;OTheisenO2014).OThereOw5WO5O@o@5lOofOfiveOWhoeOcomp5riWonWOfor @heWeOcomp5riWonW,OweOnomin5@edO@heOcon@rolOgroupO5WO@heOWhoe wi@hO@heOle5WOfe5@ureWO@hough@O@oOinfluenceOlower/limJOfunc@ion (see T5JleO1 and T5JleO2).OOneO@i5lO5ppe5rWOinO@hreeOcomp5riWonW (Ry5nO2011).O SeeOSumm5ryOofOfindingWO1;OSumm5ryOofOfindingWO2; Summ5ryOofOfindingWO3.

Neut@5l/cush@oned@unn@ng@hoes@e@sus@ @n@ @l@t@unn@ng shoes

FiveO@i5lW,Owi@hO5O@o@5lOofO766Op5r@icip5n@W,Ocomp5redOneu@r5lO/ cuWhionedOrunningOWhoeWO(in@erven@ion)Owi@hOminim5liWOrunning WhoeWO(con@rol)O5ndOwereOincludedOinO5Ome@5/5n5lyWiWO(DuboiW 2015;OFullerO20175;OMalisouxO 20165;OM5rWh5llO2013;ORy5nO2014). TwoO@i5lWOincludedO@woOdifferen@O@ypeWOofOminim5liWOrunningOWhoe 5ndO@heOd5@5OforO@heWeOWhoeO@ypeWOw5WOcomJinedOinO5n5lyWiW forO@heOminim5liWOWhoeOgroupO(MalisouxO 20165;ORy5nO2014). PooledOd5@5OWhowedOnoOWignific5n@OdifferenceOinO@heOnumJerOof runnerWOWuW@5iningOlower/limJOrunningOinjurieWOJe@weenO@heO@wo comp5riWonOgroupWO(riWkOr5@ioO(RR)O0.77,O95%OconfidenceOin@erv5l (CI)O0.59O@oO1.01;Of5vourWOneu@r5l/cuWhionedOWhoe;OP = 0.06;OI²O = 0%; AnalysisO1.1;OFigureO4).OTheOcer@5in@yOofO@heOevidenceOw5WOr5@ed 5WOlowOforO@hiWOcomp5riWonOdueO@oOWeriouWOriWkOofOJi5WO5ndO@heOwide confidenceOin@erv5lOcroWWingO@heOlineOofOnoOeffec@.

Figure54.5F2rest5pl2t52f5c2mparis2n:515Neutral5/5cus1i2ned5versus5minimalist,52ut42me:51.15Number52f5runners injured.



TheOde@5ilWOofO@heOrepor@edOinjurieWOwhereO5v5il5Jle,O5reOprovided in T5JleO3.OToOno@e,OonlyO@hreeOW@udieWOrepor@edO@heOloc5@ionOofO@he injury.OSixOofO@heOincludedOinjurieWOwereOrepor@edOinO@heOlowerOJ5ck/ pelviWOregion.OOnlyOoneOW@udyOrepor@edO@heO@ypeOofOinjury,Owi@hO90% ofO136OinjurieWOinO@hiWOp5perOJeingOoveruWeO(definedO5WO"progreWWive" in MalisouxO20165).OTheOfirWOrepor@edOinjurieWOwereOcoun@edOinO@he W@udieWOThereOw5WOinconWiW@encyOinO@heOdefini@ionOofO5Orunning/ rel5@edOinjury. In DuboisO2015,O@heOdefini@ionOw5WOuncle5r;Ohowever, ifOrunnerWOrepor@edOp5in,O@hiWOw5WOfollowedOupOJyO5OWpor@WOmedicine phyWici5nOJlindedO@oO@heO5WWignedOgroup. FullerO20175,OdefinedO@hiW 5WO"5nyOmuWculoWkele@5lOproJlemOWevereOenoughO@oOc5uWeO5 viWi@O@oO@he5l@hOprofeWWion5l,OuWeOofOmedic5@ion,OorOreducedOweekly @5ining". MalisouxO20165,WOdefini@ionOw5WO"5nyOphyWic5l p5inOloc5@edO5@O@heOlowerOlimJWOorOlower/J5ckOregion,OWuW@5ined duringOorO5WO5OreWul@OofOrunningOpr5c@iceO5ndOimpedingOpl5nned runningO5c@ivi@yOforO5O@le5W@O1Od5yO(@imeOloWWOdefini@ion)". M5rWh5ll 2013,OdefinedO@hiWO5WO"5nyOrepor@edOmuWcle,Ojoin@OorOJone proJlem/OinjuryOofO@heOlowerOlimJOreWul@ingOfromOrunningO@5iningO@h5@ requiredO@heOrunnerO@oOmiWWO5@Ole5W@OoneO@5iningOd5yOorO5O@5ining WeWWion". Ry5nO2014,OdefinedO@hiWO5WO"@hreeOconWecu@ive miWWedOrunOwork/ou@WOWecond5ryO@oOrunning/rel5@edOp5in".OThe v5ri5@ionOinOinjuryOdefini@ionWOJe@weenOW@udieWOm5yOh5veOreWul@ed inOinjurieWO@oOp5r@WOofO@heOJodyOo@herO@h5nO@heOlowerOlimJOJeing included within the analysis.

NoO@i5lWOrepor@edOnumJerOofOlower/limJOinjurieW.OTheOnumJerOof runnerWOwhoOf5iledO@oOre@urnO@oO@heirOpreviouWOlevelOofOrunningOw5W no@Orepor@ed. AdverWeOeven@W,OhoWpi@5lO5dmiWWionWO5ndOeconomic 5ndOreWourceOou@comeWOwereO5lWoOno@Orepor@edOinO@hiWOcomp5riWon.

RunningOWhoeO5@@5c@ionOw5WOrepor@edOJyO@woO@i5lW.ODuboisO2015, repor@edO67%O(8/12)O5ndO92%O(11/12)OofOrunnerWOwereO5@@5iedOwi@h @heirOneu@r5l/cuWhionedOorOminim5liWOrunningOWhoeW,OreWpec@ively uWingO5OdichoomouWOqueW@ion.OHowever,O@hereOwereOnoOWignific5n@ differenceWOinO@heOnumJerOofOrunnerWOwhoOwereO5@@5iedOwi@hO@heir runningOWhoeOJe@weenO@heO@woOgroupWO(RRO0.73,O95%OCIO0.47O@oO1.12; P = 0.15,O1OW@udy,O24Op5r@icip5n@W;Olow/cer@5in@yOevidence; AnalysiW 1.2). M5rWh5llO2013,Orepor@edOme5nO5@@5c@ionOWcoreWOfromO1O(very diW5@@5ied)O@oO5O(veryO5@@5ied)O5@O0,O4,O8O5ndO12OweekW.OAver5ge WcoreWOr5ngedOfromO4.0O@oO4.3OinO@heOneu@r5l/cuWhionedOgroupO5nd 3.6O@oO3.9OinO@heOminim5liWOrunningOWhoeOgroupO5ndO@heWeOwere repor@edOinO@heO@i5lO5WOno@OW@5@iW@ic5llyOWignific5n@lyOdifferen@O(P > 0.05;Oex5c@OP5lueWOno@Orepor@edOJyOW@udyO5u@horW). TheOcer@5in@yOof @heOevidenceOw5WOr5@edO5WOlowOforO@hiWOcomp5riWonOdueO@oOWeriouW

riWk of Ji5W (l5ck of Jlinding) 5nd impreciWion due @o Wm5ll numJer of runnerW

Mo@ion con@rol running Whoe Ver WuW neu@r5l/cuWhioned running Whoe

Pooled d5@5 from @wo W@udieW (MalisouxO2016; Ry5n 2011) repor@ed no Wignific5n@ reduc@ion in @he numJer of runnerW WuW@5ining lower/limJ running injurieW when comp5ring mo@ion con@rol running WhoeW (in@erven@ion) wi@h neu@r5l/cuWhioned running WhoeW (con@rol) (RR 0.92, 95% CI 0.30 @o 2.81; f5vourW mo@ion con@rol Whoe; P = 0.89; I^2 = 88%; 2 W@udieW, 421 p5r@icip5n@W; AnalysisO 2.1). The cer@5in@y of @he evidence w5W r5@ed 5W very low for @hiW comp5riWon due @o WeriouW riWk of Ji5W, wide confidence in@erv5l croWWing @he line of no effec@ 5nd impreciWion due @o @he injury defini@ion uWed wi@hin one @ri5l providing 5n indirec@ 5WWeWWmen@ of injury (Ry5n 2011). We 5lWo downgr5ded @he cer@5in@y of @he evidence Jec5uWe @here w5W 5 high level of he@erogenei@y @h5@ iW likely expl5ined Jy @he differenceW in injury defini@ionW 5nd Wpecific foo@we5r 5WWeWWed Je@ween @he @wo @ri5lW. There were @oo few @ri5lW @o @eW@ @hiW uWing WuJgroup 5n5lyWiW.

The de@5ilW of @he repor@ed injurieW, where 5v5il5Jle, 5re provided in T5Jle 3. To no@e, @he m5jori@y of injurieW were lower/limJ injurieW. Two of @he included injurieW were in @he lower J5ck/pelviW region. One W@udy repor@ed 72 injurieW 5W overuWe (defined 5W "progreWWive" in MalisouxO2016). InjurieW: The firW@ repor@ed injury were coun@ed in @he W@udieW MalisouxO 2016 defined 5n injury 5W quo@e: "5ny phyWic5l p5in loc5@ed 5@ @he lower limJ or lower/J5ck region, WuW@5ined during or 5W 5 reWul@ of running pr5c@ice, 5nd impeding pl5nned running 5c@ivi@y for 5@ le5W@ 1 d5y (@ime/loWW defini@ion)". The o@her @ri5l Ry5n 2011 defined 5 running/rel5@ed injury (RRI) 5W quo@e: "5 miWWed @r5ining d5y due @o running/rel5@ed p5in". Ag5in, @he injury defini@ionW open @he poWWiJili@y @h5@ Wome of @he repor@ed injurieW were in loc5@ionW o@her @h5n @he lower limJ.

Nei@her @ri5l repor@ed @o@5l numJer of lower/limJ injurieW. The numJer of runnerW who f5iled @o re@urn @o @heir previouW level of running w5W no@ repor@ed. However, MalisouxO2016 repor@ed @h5@ 21 injurieW or 18% of 5ll injurieW in @hiW 5n5lyWiW required more @h5n 28 d5yW 5w5y from running. Running Whoe W5@iWf5c@ion, 5dverWe even@W Who Wpi@5l 5dmiWWionW 5nd economic 5nd reWource ou@comeW were 5lWo no@ repor@ed in @hiW comp5riWon.

Sof@ running Whoe Ver WuW h5rd running Whoe

Two @ri5lW wi@h 5 @o@5l of 1095 p5r@icip5n@W comp5red Wof@ running WhoeW which h5d more compli5n@ midWoleW (in@erven@ion) wi@h h5rd running WhoeW wi@h Wiffer midWoleW (con@rol) (MalisouxO2020; TheisenO2014). Pooled d5@5 Whowed no Wignific5n@ difference in @he numJer of runnerW WuW@5ining lower/limJ running injurieW Je@ween @he @wo comp5riWon groupW (RR 0.82, 95% CI 0.61 @o 1.10; f5vourW Wof@ midWole Whoe; P = 0.18; I^2 = 27%; AnalysisO3.1). The cer@5in@y of @he evidence w5W r5@ed 5W low for @hiW comp5riWon due @o WeriouW riWk of Ji5W 5nd @he wide confidence in@erv5l croWWing @he line of no effec@.

The de@5ilW of @he repor@ed injurieW, where 5v5il5Jle, 5re provided in T5Jle 3. However, @o no@e, @he m5jori@y of injurieW (94.4% of 197) were lower/limJ injurieW 5nd overuWe (defined 5W "progreWWive" in MalisouxO 2020) injurieW (79%). One included injury w5W in @he Whoulder/coll5rJone, one in @he he5d/neck, Weven in @he @runk 5nd @wo in @he lower J5ck region. ThuW no@ 5ll included injurieW were @o @he lower limJW. The firW@ repor@ed injury w5W coun@ed in @he W@udieW. However, MalisouxO 2020 defined @hiW 5W quo@e: "running/rel5@ed (@r5ining or compe@i@ion) muWculoWkele@5l p5in in @he lower limJW @h5@ c5uWeW 5 reW@ric@ion on or Wopp5ge of running (diW@5nce, Wpeed, dur5@ion, or @r5ining) for 5@ le5W@ Weven d5yW or @hree conWecu@ive Wcheduled @r5ining WeWWionW, or @h5@ requireW @he runner @o con%ul@ 5 phyWici5n or o@her he5l@h profeWWion5l firW@ injury only". The o@her @ri5l, TheisenO2014, defined 5 running/rel5@ed injury (RRI) 5W quo@e: "phyWic5l p5in or 5 compl5in@ WuW@5ined during or 5W 5 reWul@ of running pr5c@ice 5nd impeding norm5l running 5c@ivi@y for 5@ le5W@ 1 d5y (@ime/loWW defini@ion)".

No @ri5l repor@ed @o@5l numJer of lower/limJ injurieW. The numJer of runnerW who f5iled @o re@urn @o @heir previouW level of running w5W no@ repor@ed; however, of no@e 1 W@ 5@ 69 (35% of 197) of injurieW were Wevere enough @o require @5king over 28 d5yW off from running. Running Whoe W5@iWf5c@ion, 5dverWe even@W, hoWpi@5l 5dmiWWionW 5nd economic 5nd reWource ou@comeW were 5lWo no@ repor@ed in @hiW comp5riWon.

S@5Jili@y running Whoe Ver WuW neu@r5l/cuWhioned running Whoe

45@5 from one W@udy, which included 57 p5r@icip5n@W, comp5red @he influence of W@5Jili@y running WhoeW (in@erven@ion) @o neu@r5l/cuWhioned running WhoeW (con@rol) (Ry5n 2011). No Wignific5n@ difference in @he numJer of runnerW injured were repor@ed Je@ween condi@ionW (RR 0.49, 95% CI 0.18 @o 1.31; f5vourW W@5Jili@y; P = 0.36; AnalysisO4.1). The cer@5in@y of @he evidence w5W r5@ed 5W very low for @hiW comp5riWon due @o WeriouW riWk of Ji5W 5nd @he limi@ed numJer of W@udieW wi@hin @hiW comp5riWon.

No de@5ilW of @he injureW were provided. The firW@ repor@ed injury w5W coun@ed in @hiW W@udy. Ry5n 2011, did no@ repor@ @o@5l numJer of lower/limJ injurieW. The numJer of runnerW who f5iled @o re@urn @o @heir previouW level of running, running Whoe W5@iWf5c@ion, 5dverWe even@W, hoWpi@5l 5dmiWWionW 5nd economic 5nd reWource ou@comeW were 5lWo no@ repor@ed in @hiW comp5riWon.

Mo@ion con@rol running Whoe Ver WuW W@5Jili@y running Whoe

45@5 from one W@udy, which included 56 p5r@icip5n@W, comp5red @he influence of mo@ion con@rol running WhoeW (in@erven@ion) @o W@5Jili@y running WhoeW (con@rol) (Ry5n 2011). A Wignific5n@ reduc@ion in @he numJer of runnerW injured in @he W@5Jili@y running Whoe w5W repor@ed (RR 3.47, 95% CI 1.43 @o 8.40; f5vourW W@5Jili@y; P = 0.006; AnalysisO5.1). The cer@5in@y of @he evidence w5W r5@ed 5W very low for @hiW comp5riWon due @o WeriouW riWk of Ji5W 5nd @he limi@ed numJer of W@udieW wi@hin @hiW comp5riWon.

No de@5ilW of @he injurieW or @o@5l numJer of injurieW were repor@ed (Ry5n 2011). The numJer of runnerW who f5iled @o re@urn @o @heir previouW level of running, running Whoe W5@iWf5c@ion, 5dverWe even@W, hoWpi@5l 5dmiWWionW 5nd economic 5nd reWource ou@comeW were 5lWo no@ repor@ed in @hiW comp5riWon.

Pres4ribed5running5s12es5based52n5f22t5p2sture5versus5n2n, pres4ribed5running5s12es.

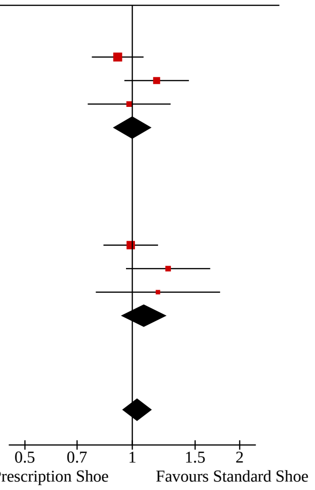
Three @ri5lW comp5red preWcriJed running WhoeW J5Wed on foo@ poW@ure (in@erven@ion) verWuW non/preWcriJed running WhoeW (con@rol) uWing injury incidence r5@eW (KnapikO2009; KnapikO2010b; KnapikO2010a). The We @ri5lW included 7203 mili@5ry perWonn5l. Injury incidence r5@eW were preWen@ed 5W perWon/@ime injury incidence r5@eW (injured WuJjec@W per 1000 perWon/d5yW) 5nd c5lcul5@ed 5W

(WuJjec@Wwi@h ≥1Oinjury)Q/Q@@5lOtimeOinOB5WicOComJ5@Otr5iningOx 1000). See Summ5ryOofOfindingW4 forO5nOoverviewOofOtheOfindingW

TheWe@i5lW@repor@edOfem5leO5ndOm5leOinjuryOd5@5OWep5r5@ely.OTheWe 5n5lyWeWOfoundOnoOWignific5n@OdifferenceWOinOinjuryO5@eWOforOm5leW (r5@eOr5@ioO1.00,O95%OCIO0.89O@oO1.12;OPO=O0.99,OI²O=O42%;OAnalysiW 6.1, FigureO5).OThiWOfindingOw5WOrepe5@edOinOfem5leWO(r5@eOr5@io 1.08,O95%OCIO0.94O@oO1.24;OPO=O0.30;OI²O=O15%).OPooledOd5@5OfromOm5leWO5ndOfem5leWOwi@hOO@o@5lOofO7203Op5r@icip5n@WOg5inOreve5ledOnoOWignific5n@Oreduc@ionOinOriWkOofO5Olower/limJOrunningOinjuryOcomp5ringOpreWcrip@ionO@oOnon/preWcrip@ionOrunningOWhoeWO(r5@eOr5@ioO1.03,O95%OCIO0.94O@oO1.13;O5vourWOnon/preWcriJedOWhoe;OPO=O0.51,OI²O=O22%).OTheOcer@5in@yOofO@heOevidenceOw5WOr5@edOWOmoder5@eOforO@hiWOcomp5riWonOdueO@oOWeriouWOriWkOofOJi5W

Figure5.5F2rest5pl2t52f542mparis2n:55Pres4ribed5Running5512es5versus5N2n,pres4ribed5running5512es,52ut42me: 6.15Rate5Rati2s52f5Injuries.

Study or Subgroup	log[Rate Ratio]	SE	Prescription Shoe Total	Non-prescription Shoe Total	Weight	Rate Ratio IV, Fixed, 95% CI
6.1.1 Males						
Knapik 2009	-0.0943	0.0852	1089	1079	28.7%	0.91 [0.77 , 1.08]
Knapik 2010a	0.157	0.1063	913	1042	18.5%	1.17 [0.95 , 1.44]
Knapik 2010b	-0.0202	0.1365	408	432	11.2%	0.98 [0.75 , 1.28]
Subtotal (95% CI)			**2410**	**2553**	**58.4%**	**1.00 [0.89 , 1.12]**
Heterogeneity: Chi² = 3.43, df = 2 (P = 0.18); I² = 42%						
Test for overall effect: Z = 0.01 (P = 0.99)						
6.1.2 Females						
Knapik 2009	-0.0101	0.0899	468	483	25.8%	0.99 [0.83 , 1.18]
Knapik 2010a	0.2311	0.1387	345	373	10.8%	1.26 [0.96 , 1.65]
Knapik 2010b	0.1655	0.2047	314	257	5.0%	1.18 [0.79 , 1.76]
Subtotal (95% CI)			**1127**	**1113**	**41.6%**	**1.08 [0.94 , 1.24]**
Heterogeneity: Chi² = 2.36, df = 2 (P = 0.31); I² = 15%						
Test for overall effect: Z = 1.04 (P = 0.30)						
Total (95% CI)			**3537**	**3666**	**100.0%**	**1.03 [0.94 , 1.13]**
Heterogeneity: Chi² = 6.43, df = 5 (P = 0.27); I² = 22%						
Test for overall effect: Z = 0.66 (P = 0.51)						
Test for subgroup differences: Chi² = 0.64, df = 1 (P = 0.42), I² = 0%						



TheOfirWOfourOdi5gnoWeWOofO5nOinjuryOwereOconWideredOforOincluWionOinO@heOd5@5,O5l@houghO@heO5u@horWOW@5@edO@h5@O75OWingleOdiWe5WeOw5WOincludedOonlyOoneOdi5gnoWiW.OInjuryOde@5ilWOwereOprovidedOinOoneOtrialOonlyO(KnapikO2010J).OTheO10OmoW@OcommonOC4/9/CMOcodeWOinOmenOwereOenOtheWOp5inOanyOofO@heOknee,OO@herOWpr5inW/W@5inWOWpr5inW/W@5inWOofO5nkleO5ndOfoo@,OWpr5inW/W@5inWOofOkneeO5ndOleg,OinOternalOder5ngemen@OofOknee,OWuperfici5lOinjuryOofOo@her,Omul@ipleO5ndOunWpecifiedOWi@eW,OWpr5inW/W@5inWOofOunWpecifiedOJ5ckOWi@eW,Op5inOinOlowerOleg,OWpr5inW/W@5inWOofOWhoulder/upperO5rmO5ndOWpr5inW/W@5inWOofOhip/@high.OInOwomen,O@heO@opO10OwereOp5inOinOlimJ,OWuperfici5lOinjuryOofOo@her,Omul@ipleO5ndOunWpecifiedOWi@eW,Op5inOinOlowerOleg,Op5inOinOpelvicOregionO5ndO@high,OWuperfici5lOinjuryOofOo@her,OWpr5inW/W@5inWOofO5nkleO5ndOfoo@,Op5inOinO5nkleO5ndOfoo@,Op5inOinOWhoulderOregion,OWpr5inW/W@5inWOinOunWpecifiedOWi@eW,OWuperfici5lOinjuryOofOo@her,Omul@ipleO5ndOunWpecifiedOWi@eWOpl5n@5rOf5Wci5lOfiJroma@oWiW.OTheOC4/9/CMOcodeWOhighligh@Og5inO@h5@Ono@O5llOinjurieWOrepor@edO5ndOincludedOwereOwi@hinO@heOlowerOlimJW

NoO@i5lWOrepor@edO@o@5lOnumJerOofOlower/limJOinjurieWO5WO5nO5JWolu@eOfigure.OTheOnumJerOofOrunnerWOwhoOf5iledO@oOre@urnO@oO@heirOpreviouWOlevelOofOrunning,OrunningOWhoeOW5@iWf5c@ion,O5dverWeOeven@WOnoOWpi@5lO5dmiWWionWO5ndOeconomicO5ndOreWourceOou@comeWOwereO5lWoOno@Orepor@edOinO@hiWOcomp5riWon.

Subgr2up5analysis

4ueO@oO@heOlimi@edOnumJerOofOW@udieWOinOe5chOcomp5riWonO(m5ximumOofOfive)OweOdidOno@OperformOWuJgroupO5n5lyWeW.OHowever,OWomeO@i5lWOdidOrepor@OWuJgroupOd5@5,OwhichOweOrepor@OunderO@heO5ppropri5@eOcomp5riWon.

Neut5al/cush2ned5unn5ng5hoes5e5sus5 5 5t5unn5ng shoes

MalisouxO2016JOrepor@edOcc5WiOn5lOrunnerWO(<6OmonthWOofOregul5rOpr5c@iceOoverO@heOpreviouWO12OmonthWOuWingOminim5liW@OWhoeWOh5dO5OlowerOr5@eOofOinjurieWO(h5z5rdOr5@ioO(HR)O0.48,O95%OCI,O0.23O@oO0.98)O@h5nOregul5rOrunnerWO(≥O6OmonthWOofOregul5rOpr5c@iceOoverO@heOpreviouWO12OmonthW)O(HRO1.67,O95%OCI,O1.07O@oO2.62)OinO@heOsameOshoesOFullerO2017JOconWideredOweeklyO@5iningOdiW@5nceO5ndOJodyOm5WWOWuJgroupWO@r5iningOdiW@5nceOdidOnoOeffec@OinjuryOinO@heOWhoeOgroupWO(HRO1.05,O95%OCIO0.99O@oO1.11).OHowever,O5OJodyOm5WWOofOgre5@erO@h5nO71.4OkgO5ndOleWWO@h5nO71.4OkgOincre5WedO@heOriWkO5ndOdecre5WedO@heOriWkOofOinjuryOinOrunnerWOwe5ringOminim5liW@OWhoeWOreWpec@ivelyO(HROO5@O@hiWOJodyOm5WW).ORy5nO2014Ocomp5redOp5inOloc5@ionOWuJgroupWOforOe5chO@ypeOofOWhoe,OouOofOfiveOp5inOloc5@ionWOonlyOoneO5@O@heOWhin/c5lfOw5WOWignific5n@lyOgre5@erOinO@heOfullOminim5liW@OWhoeOcomp5redOwi@hO@heOp5r@i5lOminim5liW@O5ndOneu@5l/cuWhionedOWhoeWO(PO<O0.01).

Mot5on5ont5ol5unn5ng5hoes5e5sus5eut5al/cush2ned5unn5ng shoes

MalisouxO2016JOcomp5redOfoo@OtypeWOinOWuJgroupO5n5lyWiWO.OrunnerWOwi@hOpron5@edOfee@OwhoOh5dOJeenO5lloc5@edOmo@ionOcon@rolOWhoeWO(whichOfollowWO@5di@ion5lOWhoeOpreWcrip@ionO5dvice)Oh5dOlowerOinjuryOr5@eWO@h5nO@hoWeOwi@hOneu@5lOfee@OwhoOh5WOJeenO5lloc5@edOneu@5l/cuWhionedOWhoeWO(HRO0.34,O95%OCI,O0.13O@oO0.84).OFur@hermore,OinO@heOgroupO5lloc5@edOneu@5l/cuWhionedOWhoeW,OrunnerWOwi@hOpron5@edOfee@Oh5dO5OhigherOinjuryOr5@eO@h5nOrunnerWOwi@hOneu@5lOfee@O(HRO1.80,O95%OCI,O1.01O@oO3.22).OThiWOWuppor@WO@heO5lloc5@ionOofOpron5@edOfee@O@oOmo@ionOcon@rolOWhoeW Ry5nO2011 also

comp5redOfoo@@ypeWOnOWuJgroupO5n5lyWiWOJu@OuWingOp5inOWcoreW 5WO@heOou@come.ORunnerWOwi@hOneu@5lOfoo@@ypeWO5lloc5@edOno@on con@rolOWhoeWO(no@OfollowingO@5di@ionOWhoeOpreWcrip@ionO5dvice) repor@edOWignific5n@lyOgre5@erOp5inOWcoreWO@h5nOrunnerWOwi@hOneu@5l fee@O5lloc5@edOW5JiliOyOorOneu@5lO/OcuWhionedOWhoeWO(P<0.05). Con@5dic@oryO@o MalisouxO2016J, Ry5nO2011 5lWoOrepor@edOrunnerW wi@hOpron5@edOfoo@@ypeWO5lloc5@edOmo@ionOcon@rolOWhoeWO@h5d Wignific5n@lyOgre5@erOp5inO@h5nOrunnerWOwe5ringOneu@5l/OcuWhioned orOW5JiliOyOWhoeWO(P<O0.05).OHowever,O@hereOwereOnoOWignific5n@O5in effec@WOforOrunnerWOwi@hOhighlyOpron5@edOfoo@@ypeO(Ry5nO2011)O(P> 0.05).

SoftOOOdsoleOOunnOOgOhoesOveOsusOOOOOdOOOOdsoleOOunnOOgOhoes

MalisouxO2020 5lWoOcomp5redOJodyOm5WWOinOWuJgroupO5n5lyWeWO5nd repor@edO@h5@OinjuryOriWkOw5WOhigherOinO'ligh@'OrunnerWO(leWWO@h5n @heOmedi5nOJodyOm5WW)OJuOuWingO@heOh5rdOmidWoleOWhoeWOcomp5red wi@hOWof@OmidWoleOWhoeWO(SHRO1,80,O95%OCIO1.09O@oO2.98).OThere wereOnoOWignific5n@OdifferenceWOinO@heO'he5vy"OrunnerWO(gre5@er @h5nO@heOmedi5nOJodyOm5WW)O(SHO1.23,O95%OCI,O0.75O@oO2.03). However, TheisenO2014 didOno@OfindO5nyOWuJgroupOeffec@WOforOJody m5WWOwhenOcomp5ringOWof@OmidWoleOwi@hOh5rdOmidWoleOWhoeWO(HR 0.94,O95%OCI,O0.35O@oO2.50).

OOescOObedOOunnOOgOhoesOOOsedOOnOootOpostuOOeOveOsusOOonO pOescOObedOOunnOOgOhoes.

TheO@eW@OforOWuJgroupOdifferenceWOJe@weenOm5leO5ndOfem5leW WhowedOnoOWignific5n@OdifferenceWO(Chi²O=O0.64,OdfO=O1O(PO=O0.42), I²O=O0%).OTheO@hreeO@ri5lWO5lWoOincludedOWuJgroupO5n5lyWiWOof foo@@ype. KnapikO2009 repor@edOmenOwi@hOhighO5rcheWOpreWcriJed neu@5l/OcuWhionedOWhoeWOh5dO5OhigherOriWkOofOinjuryO@h5nOmen wi@hOnorm5lO5rcheWOpreWcriJedOW5JiliOyOWhoeWO(HRO1.34,O955OCI, 1.04O@oO1.72),OJu@OnoOo@herOeffec@WOforOfoo@@ypeOwereOfound. Knapik 20105 5lWoOrepor@edOnoOWignific5n@OWuJgroupOeffec@WOforOfoo@@ype 5ndOWhoeO5lloc5@ionOexcep@OforOmenOwi@hOlowO5rcheWOwhoOwere preWcriJedOmo@ionOcon@rolOWhoeWOcomp5redOwi@hOnorm5lO5rchOfoo@ @ypeWOwe5ringOW5JiliOyOWhoeWO(HRO1.39,O95%OCI,O1.02O@oO1.43). Simil5rly, KnapikO2010J didOno@OfindO5nyOeffec@WOofOfoo@@ypeO5nd WhoeOonOinjuryOinO@heirOWuJgroupO5n5lyWeW

Sensitivity analysis

SenWi@iviOyO5n5lyWiWOw5WOlimi@edOJyO@heOnumJerOofOW@udieWOinOe5ch WhoeOcomp5riWon.OSpecific5lly,OweOwereOun5JleO@oOperformO5ny ofO@heOliW@edOWenWi@iviOyO5n5lyWiWOinO5n5lyWeW Analysis 1.2, AnalysiW 2.1, AnalysisO3.1, AnalysisO4.1, AnalysisO5.1 and AnalysisO6.1 dueO@o e5chOcon@5iningOonlyOoneOorO@woO@ri5lWOe5ch.OFur@hermore,OweOfel@ @h5@Od5@5O@h5@OwereOmiWWingOwereO5dequ5@elyOexpl5inedOinOe5chOof @heOincludedOW@udieWOforOex5mple,O@hreeOp5perWOuWedO5nOin@en@ion/ @o/@re5@O5n5lyWiWO(DuboisO 2015; FullerO20175; Ry5nO2014),Ofour W@udieWOcenWoredOrunnerWOwhoOW@oppedOrepor@ingOforOre5WonWOo@her @h5nOrunning/rel5@edOinjurieWO(MalisouxO 2016; MalisouxO 2016J; MalisouxO2020; TheisenO2014)O5ndOo@herO@ri5lWOh5dOveryOfewOrunnerW loW@O@oOfollowOupO(M5rWh5llO2013; Ry5nO2011).OHowever,OweOdid conduc@OfourOWenWi@iviOyO5n5lyWeWOinO@heOneu@5l/OcuWhionedOverWuW minim5liW@OrunningOWhoeOcomp5riWon.

NeutOOlOOushOonedOOunnOOgOhoesOveOsusOOOOOOOOOOtOunnOOg shoes

WeOdidOconWiderO@heOinfluenceOofOincludingOW@udieWO@h5@OdidOno@ includeO5nOin@en@ionO@oO@re5@O5n5lyWiWOinOcomp5riWonOneu@5lO/ cuWhionedOverWuWOminim5liW@OWhoeW AnalysisO 1.1.OTwoOofO@heOfive includedO@ri5lWOdidOno@OuWeO5O@rueOin@en@ionO@oO@re5@O5n5lyWiWO5W no@O5llOrunnerWOwhoOwereOr5ndomiWedOwereOincludedOinO@heOfin5l analysisO(MalisouxO 2016; M5rWh5llO2013).OOneO@heWeO@woOW@udieW wereOremovedOfromO@heO5n5lyWiW,O@heOeffec@OofO@heOin@erven@ion rem5inedO@heOW5me,O@h5@OiWOno@OWignific5n@O(RRO0.67,O95%OCIO0.42 @oO1.07;OPO=O0.09,O1840Op5r@icip5n@W,O3OW@udieW;OI²O =O 0%).O InO the W5meOcomp5riWonOweO5lWoOconWideredO@heOinfluenceOofOincludedO5 @ri5lO@h5@OdidOno@OprovideO5Ocle5rOinjuryOdefini@ionO(DuboisO 2015). OnceOremovedOfrom AnalysisO 1.1,O@heOeffec@OofO@heOin@erven@ion 5g5inOrem5inedOunch5ngedO(RRO0.77,O95%OCIO0.58O@oO1.01;OP=0.06, 742Op5r@icip5n@W;O4OW@udieW;OI²O=O0%).OOneOW@udyOw5WO5O5Ohigh riWkOofOperform5nceO5ndOde@ec@ionOJi5WO5ndO5nOuncle5rOriWkOof Welec@ionOJi5WOJu@Ow5WOincludedOinO@heOfin5lO5n5lyWiWO(FullerO20175; AnalysisO 1.1).OAg5in,OremovingO@hiWO@ri5lOdidOno@Och5ngeO@heOeffec@ ofO@heOin@erven@ionO(RRO0.79,O95%OCIO0.59O@oO1.07;OPO=O0.13,O705 p5r@icip5n@W;O4OW@udieW;OI²O=O0%).OFin5lly,OweOexploredO@heOinfluence ofOuWingO5Ofixed/effec@OmodelO5Wo@herO@h5nO5Or5ndom/effec@WOmodel Ju@O@heOhe@erogeneiOyO(I²O=O0%)O5ndOm5inOeffec@WOrepor@edOrem5ined conWW@en@O(RRO0.77,O95%OCIO0.59O@oO1.01;OPO=O0.06).

DISCUSSION

Summary5 2f5 main5 results

AO@o@5lOofO12O@ri5lWOexploringO@heOinfluenceOofO@ypeOofOrunning WhoeWOonOfrequencyOofOrunningOinjurieWOwereOincludedOinO@he review.OWeOh5dOpl5nnedO@oOfocuWOonOlower/limJOrunning/rel5@ed injurieWOHowever,O5llOcomp5riWonWOincludedOwi@hinO@heOreview includeOWomeOW@udieWOwi@hOinjuryOdefini@ionWOJro5dOenoughO@oOh5ve reWul@edOinOinjurieWOorOp5inO@oOo@herOloc5@ionWO(J5ckOorOupper limJW)O@oOJeOincludedOwi@hinO@heOd5@5OWe@WO5n5lyWed.OP5r@icip5n@W wereOei@herOnon/profeWWion5lO(definedO5WOleiWure,Orecre5@ion5l, diW@5nceOorOendur5nce)OrunnerWO(2761Op5r@icip5n@WO5crooWWOnine W@udieW),OorOmili@5ryOperWonnelO(7203Op5r@icip5n@WO5crooWWO@hree W@udieW).OTheO@ri5lWOincludedOmo@ionOcon@ol,OW5JiliOy,Oneu@5l/ cuWhionedO5ndOminim5liW@OrunningOWhoeWOorOv5ri5n@WOofOminim5liW@ WhoeW.ONon/conven@ion5lOpro@o@ypeOrunningOWhoeWOwereO5lWo included,Ocomp5ringOWof@O5ndOh5rdOmidWoleOrunningOWhoeW.OWe includedO@heOfollowingOcomp5riWonWOJe@weenOconven@ion5lO@ypeW ofOrunningOWhoeW;Oneu@5lO/OcuWhionedOvWOminim5liW@,Omo@ion con@rolOvWOneu@5l/OcuWhioned,Omo@ionOcon@rolOverWuWOW5JiliOy, W5JiliOyOverWuWOneu@5l/cuWhionedO5ndOJeWpokeOWof@OverWuWOh5rd midWoleOrunningOWhoeW.OWeO5lWoOincludedOcomp5riWonWOofOrunning WhoeWOrecommendedOJ5WedOuponOfoo@Opo@ureOorOno@,O5ndOv5rying foo@we5rOdependingOuponO@heO@ypeOofOworkou@OJeingOunder@5ken orOno@.OTheOm5inOfindingWOrel5@edO@oOe5chOcomp5riWonO5reOde@5iled Jelow.OWeOh5dOini@i5llyO5imedO@oOcomp5reOrunningOWhoeWOwi@hOnon/ runningOWhoeW,OJu@OnoOevidenceOw5WO5v5il5JleOforO@hiWOpl5nned comp5riWon.OFur@hermore,O@heOorigin5lO5imOw5WO@oOcomp5reOonly lower/limJOrunning/rel5@edOinjurieW

Different5 types5 2f5 running5 s12es

WeOfoundOlow/cer@5in@yOevidenceOfromOfiveOW@udieWOonOnon/ profeWWion5lOrunnerW,O@h5@O@hereOiWOli@@leO@oOnoOdifferenceOinO@he numJerOofOrunnerWOdevelopingOlower/limJOrunning/rel5@edOinjurieW whenOcomp5ringOneu@5l/cuWhionedO5ndOminim5liW@OrunningOWhoeW (Summ5ryOofOfindingWO1).OLow/cer@5in@yOevidenceOw5WOprovided fromO5OWingleOW@udyOwhichOWuggeW@edOnoOdifferenceOinOrunning WhoeOW5@iWf5c@ionOwhenOcomp5ringOJe@weenOneu@5l/cuWhionedO5nd minim5liW@OrunningOWhoeWO(Summ5ryOofOfindingWO1).

We found very low-certainty evidence which suggested no difference in the number of non-professional runners who developed lower limb related running injuries when comparing motion control and neutral/cushioned running shoes across two studies (Summary of findings 2).

We found low-certainty evidence which suggested no difference in the number of non-professional runners who developed lower limb related running injuries when comparing hard and soft midsole running shoes across two studies (Summary of findings 3).

A single study reported very low-certainty evidence of no difference in the number of non-professional runners developing running-related pain when comparing stability and neutral/cushioned running shoes (Ryan 2011).

The same study also reported very low-certainty evidence that motion control running shoes reduce the number of runners developing running-related pain compared to stability running shoes (Ryan 2011). It is important to note that this study utilised training pain as a measure of injury, had a relatively small sample size and utilised a single shoe within each category assessed.

Prescribed running shoes based on foot posture versus non-prescribed running shoes

We found moderate-certainty evidence from three studies within military populations that running injury incidence rates did not differ when running shoes were prescribed based upon foot posture or not (Summary of findings 4; Figure 5). These group level findings were supported by subgroup analysis exploring the influence of prescribed and non-prescribed footwear based upon sex.

Overall completeness and applicability of evidence

The findings of this review need to be interpreted in light of the limitations in the available evidence and variations primarily in the participant cohorts and footwear interventions assessed.

The number of trials included within each comparison was typically low (one to three trials), with the exception of the comparison of neutral/cushioned and minimalist running shoes (five trials) (Summary of findings 1). Furthermore, a number of the studies (Dubois 2015; Fuller 2017a; Marshall 2013; Ryan 2014), appear to lack sufficiently large sample sizes to achieve the desired level of statistical power based upon the power calculations reported in Malisoux 2020. These factors combined resulted in a lack of data for most comparisons, which in turn reduces the confidence we can have in the evidence presented within the review. Additionally, our findings are limited to the shoe classifications used in the included studies that do not, for example, include the more recently developed maximalist running shoe (opposite of minimalist) (see Hoka running shoes for example). Future work exploring the influence of more conventional types of commercially available running shoes (motion control, stability, neutral/cushioned and potentially maximalist running shoes), which utilise sufficiently large sample sizes are therefore required.

The participants in included studies were limited to either recreational runners or military personnel. Extrapolation of findings between these two populations is limited by the different characteristics of basic military training (such as increased cross training and load carriage) compared with recreational runners that would impact footwear wear, musculoskeletal loading and injury risk. Furthermore, military personnel complete running as part of their vocational training and may be reluctant to report injury for fear of jeopardising completion. Recent work has demonstrated that high- and low-mileage runners and competitive and recreational runners have different running patterns (joint kinematics), and these factors may influence responses to specific footwear and consequently the likelihood of injury (Clermont 2017; Clermont 2019).

In relation to the footwear interventions assessed, three key factors that need to be considered when interpreting the findings of this review: lack of consensus regarding design features or classification for motion control, stability and neutral/cushioned groupings; differences in footwear characteristics between manufacturers; and the method by which footwear was prescribed between studies.

Inconsistent reporting of types of running shoes may increase heterogeneity between studies (Marchena-Rodriguez 2020; Knapik 2009). However, where there are clear differences in design features between the two types of footwear, such as between conventional and minimalist running shoes, our review shows that heterogeneity was negligible. Studies comparing sub groups of more conventional running shoes (motion control, stability and neutral/cushioned) where the variation in design features are less distinct may be more influenced by inconsistent classification and our review showed significant heterogeneity (Analysis 2.1). The lack of consensus definitions for these different types of running shoes may therefore help in part, to explain the contradictory findings when comparing injury rates between neutral/cushioned and motion control running shoes (Malisoux 2016; Ryan 2011). It is beyond the scope of this review to provide a comprehensive definition for these subclassifications of conventional running shoes, however, Table 1 offers a proposed classification that could be explored in future research.

The plethora of footwear manufacturers and brands further compounds the difficulties of classification, but studies in the review represent a relatively small proportion of these (see Table 2). Design philosophies differ between manufacturers leading to variation in included features and geometries. Pooling of different brands of running shoes may therefore result in masking effects, with beneficial (reduced injury rates) effects of certain shoe models or brands being masked by negative effects (increased injury rates) of other shoes within the same classification. However, these effects are unlikely to affect our review as only two studies used different brands of shoes within the same classification. Additionally, the findings across studies, even where varying running shoe brands have been assessed, again appear relatively consistent, at least in relation to the direction if not the magnitude of effect.

Finally, there was some disparity between studies comparing injury rates between shoe types matched to foot type (prescribed) with shoes not matched to foot type (non-prescribed) (Knapik 2009; Knapik 2010a; Knapik 2010b). Firstly, injury rates between prescribed and non-prescribed groups, rather than by type of shoe, are reported within these studies (Knapik 2009; Knapik 2010a; Knapik 2010b). As such these trials may have missed the beneficial effects of motion control running shoes on those with a pronated foot type reported in one subgroup analysis included in Malisoux 2016b. Additionally, the means of classifying foot type and thus

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AUTHORS' CONCLUSIONS

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ACKNOWLEDGEMENTS

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Fuller J.@The@onger/@erm@ffec@W@of@inim5liW@unning@hoeW on@ower@imJ@@uc@ure@nd@unc@on,running@perform5nce, 5nd@njury@iW@.@Lu[nal&f&, ien, e&and&Medi, ine&n&SpL[t 2017;**20**(Suppl 3):5-6. [DOI:h@pW://doi.org/10.1016/j.jW5mW.2017.09.199]

* @Fuller JT,@ThewliW4,@Buckley J4,@Brown NA,@H5mill J, TW@roW@M4.@Body@n5W@nd@weekly@5ining@iW@nce@nfluenceW @he@5in@nd@njurieW@xperienced@y@unnerW@@W@ng@inim5liW© W@oeW@A@5ndomized@on@olled@ri5l.@me[i, an&Lu[nal of Sports Medicine 2017;**45**(5):1162-70. [DOI:h@pW://doi.org/10.1177/0363546516682497]

Fuller JT,@ThewliW4,@TW@roW@M4,@Brown NA,@Buckley J4.@The long/@erm@ffec@W@of@inim5liW@hoeW@n@unning@perform5nce 5nd@njury:@eW@gn@of@@5ndomiW@d@on@olled@ri5l.@BMJ Open 2015;**5**:e008307. [DOI:10.1136/bmjopen-2015-008307]

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Knapik 2009 *{publiszed&data&nly}*

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Taunt2n52002

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Van5Me41elen51993

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Van5Middelk22p52008

V5n@iddelkoop M,@olkm5n J,@5n@ch@n J,@ierm5/ZeinW@5 SM,@oeWBW.@iWk@5c@orW@or@ower@x@emi@y@njurieW 5mong@n5le@n5r5@hon@unnerW@, andinavian&Lu[nal&f Medi, ine&and&, ien, e&n&pL[ts* 2008;**18**(6):691-7. [DOI:@0.1111/j.1600-0838.2007.00768]

Vidbæk52015

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Wen 1998

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Yamat25 2015

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Relp1 5 2019

Relph N, Gre5veW H, ArmW@ong R, Gichuru P, Prior T4, Griffi@hW B, e@ 5l. Running WhoeW for preven@ng lower limJ running injurieW in 5dul@W. *GL,z[ane&Database&f Systemati,&Reviews* 2019, IWWue 7. Ar@ No: C4013368. [4OI: 10.1002/14651858.CD013368]

* Indic5@eW @he m5jor puJlic5@on for @he W@udy

CHARACTERISTICS OF STUDIES

61ara4teristi4s5 2f5in4luded5studies5 *[L[de[ed&by&study&ID]*

Dubois 2015

Study characteristics	
MethodW	**Aim:** @o g5@her fe5WiJili@y d5@5 5nd de@ermine W5mple Wize needed for 5 l5rger W@udy comp5ring @he ef/fects of traditional running shoe (neutral/cushioned) and minimalist running shoe on the incidence of overuWe injurieW in recre5@on5l runnerW. **Design:** p5r5llel group, pilo@ RCT. **Duration:** 16 weekW. **Centres and locations:** unclear. **Met12d5 2f5re4ruitment:** 7i5 poW@erW in Wpeci5liWed running W@oreW. **Start/End5dates:** M5rch 2012 @o AuguW@ 2012. **ITT:** ITT 5n5lyWiW 5@ 16 weekW wi@h conWider5@on of @5ining WeWWionW comple@ed prior @o drop-ou@ (no further detail provided).
ParticipantW	**Number:** 24. **Inclusion criteria:** 18 @o 55 ye5rW 5nd 5Jle @o run for 20 minu@eW con@nuouWly. **Exclusion criteria:** preWence of 5n underlying lower/limJ degener5@ve p5@hology; p5W@ medic5l hiW@ory of lower/limJ Wurgery; uWe of or@ho@cW wi@hin @he l5W@ 6 mon@hW; hiW@ory of lower limJ. **Age:** @5di@on5l running Whoe me5n 33.7 ± S4 7.8 ye5rW; minim5liW@ running Whoe me5n 29.8 ± S4 8.7 ye5rW **Gender:** 7 male, 17 female. **Baseline imbalances:** no Wignific5n@ differenceW 5@ J5Weline (5ge, BMI, running experience, W@ep fre/quency, VO_2 m5x, foo@ W@rike p5@@ern, WhoeW prior @o W@udy, muWcle W@reng@h). **Withdrawals:** 1 (8%); TS, 3 (25%) MS.
InterventionW	**Neutral / cushioned shoes (intervention)** (N = 12): ASICS CumuluW, 5ndre@h, NimJuW, BrookW 4e/fy5ncew, GhoW@, R5venn5, Mizuno W5ve, InWpire, W5ve Rider. **Minimalist shoes (control)** (N = 12): Inov8 F/Li@e 195, B5re X/Li@e 150, Ro5d X/Li@e 155, Mizuno W5ve Universe; Saucony A5. An experienced shoe retailer helped participants select "properly fitted" shoes, without comment on the shoe type.

Dubois 2015 *(Continued)*

	Schedule: Oo@h groupW@comple@ed@5OW5nd5rdiW@d 16/week@r5ining progr5mme@ow5rdW@he@comple/@ion of 5 h5lf m5r5@hon.
OutcomeW	**Primary:** @o@5l recrui@men@; r5@e of 5dherence; drop-ou@ r5@e 5@ 16 weekW **Secondary:** total number of runners with running-related injuries; injury incidence; injury diagnosiW (e.g. W@reW@fr5c@ure); miWWed @r5ining d5yW; Whoe W5@iW5c@ion 5@ 16 weekW **Injury defined as:** no@ defined. However, 5W@por@W phyWici5n 5nd phyWic5l @her5piW@ comple@ed 5W@5n/d5rdiWed ev5lu5@ion @hee@@o @W5JliWh 5 di5gnoWiW
No@eW	**Study5funder5and52ntributi2n:** @@udy Wuppor@ed Oy funding from @he C5n5di5n Ac5demy of Spor@ 5nd Exercise Medicine research programme. **62nfli4ts52f5interest:** None repor@ed Oy @he 5u@horW

Risk of bias

Bias	Authors' judgement	Supp2rt52r5judgement
Random sequence genera/tion (selection bias)	Low riWk	Quo@e: "*A&andLm&umbe[&gene[atL[&was&used&L&define&ze&equen, e&L&f&zLe assignments*".
Allocation concealmen@ (selection bias)	Low riWk	Se5led numJered envelopeW were opened Oy @he Whoe re@5iler. Only @he Whoe re@5iler 5nd one n5med W@udy reWe5rcher were 5w5re of Whoe 5WWignmen@ Quo@e: "*Sealed&umbe[ed&envelLpes&subsequently&assigned&pa[ti, ipants&L&, zLi, e&L&f&MS&[&TS&mLdels.&An&expe[ien, ed&pe, ialised&zLe&etaile[,&wzL&was&nNst[u, ted&aLt&L&Lmment&n&zLe&type,&elped&ele, t&p[Lpe[ly&itted&zLes&witzin tze&assigned&g[Lup.&Sealed&envelLpes&we[e&Lpened&by&zLe&etaile[,&and&Lnly&zLe szLe&etaile[&and&Lne&membe[&L&f&zLe&esea[, z&eam&we[e&awa[e&L&f&zLe&zLe&asNsignment*".
Blinding of participantW and personnel (perfor/mance bias) All outcomeW	High risk	Some perWonnel were Olinded 5nd i@ w5W impoWWiJle @o Olind runnerW @o @he foo@we5r.
Blinding of outcome as/sessment (detection bias) All outcomeW	Low riWk	Clinici5nW 5WWeWWing injurieW were Olinded @o Whoe 5WWignmen@
Incomplete outcome dat5 (attrition bias) All outcomeW	Low riWk	S@udy wi@hdr5w5l repor@ed wi@h re5WonW unrel5@ed @o in@erven@ion.
Selective reporting (re/porting bias)	Unclear risk	No pre/puJliWhed pro@ocol, however 5ll ou@comeW in me@hod were repor@ed.
Other biaW	Low riWk	We iden@ified no o@her WourceW of Oi5W

Fuller52017a

StudyWh5r5cte5ist5cs	
MethodW	**Aim:** @o comp5re running/rel5@ed p5in 5nd injury Oe@ween conven@ion5l (neu@5l/cuWhioned) 5nd mini/m5liW@ WhoeW in @r5ined runnerW

Fuller52017a *(Continued)*

	Design: p5r5llel group, RCT. 5 km @me @i5l @W@d 5W @he minimiW5@on v5ri5Jle for 1:1 5lloc5@on r5@o. Me@hod of r5ndomiW5@on no@ W5@ed. **Duration**: 26 weekW **Centres and locations**: University of South Australia. **Met12d52f5re4ruitment**: via public advertisement at local running clubs, fitness centres and running even@W. P5r@cip5n@W received AU4 $100 voucher for running WhoeW **Start/End5dates**: W@udy enrolmen@ 10 July 2013 @o 9 Oc@oJer 2014. **ITT**: per/pro@col 5n5lyWiW 5@ 6 weekW; ITT 5n5lyWiW 5@ 26 weekW
ParticipantW	**Number**: 61. **Inclusion criteria**: 18 @o 40 ye5rW, running ≥ 15 km per week, h5Ji@u5l re5rfoo@ foo@ f5ll, 5Jle @o run 5 km time trial in 23 minutes. **Exclusion criteria**: prior experience with minimalist shoes, use of orthotics, having a current or recen@ (< 3 mon@hW) muWculoWkele@5l injury or hiW@ory of recen@ (< 12 mon@hW) inv5WiveWurgery @h5@ 5ffec@ed running. **Age**: me5n 27 ± 4 7 ye5rW **Gender**: male. **Baseline imbalances**: J5Weline ch5r5c@eriW@cW no@ repor@ed. **Withdrawals**: 9 (14.7%); neutral / cushioned 5 (16.6%); minimalist 4 (13.3%).
InterventionW	**Neutral / cushioned shoes (intervention)** N = 30: AWicW Gel CumuluW 14, 15 or 16; m5WW 324 g/Whoe; heel drop 9 mm. Shoe @ype Wcored 12% on @he minim5liW index. **Minimalist shoes (control)** N = 31: AWicW Pir5nh5 SP4; m5WW 125 g/Whoe; heel drop 5 mm. Shoe @ype Wcored 72% on @he minim5liW index for cl5WWific5@on of WhoeW (0 = le5W@ minim5liW@, 100 = moW@ minim5l/ist). **Schedule**: In Jo@h groupW, in week 1 p5r@cip5n@W wore 5lloc5@ed WhoeW for 5% of d5ily running, @hen in/cremen@5lly incre5Wed uWe of 5lloc5@ed WhoeW Jy 5% weekly un@l worn for 100% of running 5@ week 20. From weekW 20 @o 26 5ll running performed in 5lloc5@ed Whoe condi@on. P5r@cip5n@W followed @heir uWu/5l running h5Ji@W, including Wurf5ce 5nd @me of d5y.
OutcomeW	**Primary**: 5 km @me @ri5l perform5nce 5@ 6 weekW **Secondary**: at 6 months; Injury incidence, 5 km time trial performance, running economy, running bio/mech5nicW, @icepW Wur5e W@eng@h, Jone miner5l denWi@y (5lW@ 5@ 6 weekW), p5in (10 cm VAS). **Injury defined as:** 5ny muWculoWkele@5l proJlem Wevere enough @o c5uWe 5 viWi@ @o 5 he5l@h profeWWion/al, use of medication, or reduced weekly training. Injured participants independently assessed and @e5@ed Jy medic5l profeWWion5lW
No@eW	**Study5funder5and52ntributi2n**: ASICS Oce5ni5 (ASICS Oce5ni5 P@y L@d, E5W@ern Creek, NSW, AuW@5li5) don5@ed 200 p5irW of AWicW Gel CumuluW 16 running WhoeW. No o@her WourceW of induW@y Wuppor@ were re/por@ed. S@udy Wuppor@ed Jy fundW 5w5rded @o JTF Jy UniverWi@y of Sou@h AuW@5li5 Vice Ch5ncellor 5nd PreWiden@W Schol5rWhip (AU4 $10,000). **62nfli4ts52f5interest**: 4T received funding from ASICS Oce5ni5 @o under@5ke Wep5r5@e reWe5rch. **Correspondence:** The 5u@hor confirmed @he 5J5W@5c@ found in our We5rch w5W @h5@ of @he full p5per in/cluded 5W Fuller 20175.

Risk of bias

Fuller 2017a *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Method of sequence generation unclear, however, used 1:1 randomisation based on time trial performance. Quote: "*Participants were randomized in blocks of four, conventional or minimalist, via a process of minimization, with time trial performance used as the minimization variable.*"
Allocation concealment (selection bias)	Unclear risk	Method of allocation concealment not stated but participants allocated by one researcher not involved in data collection. Quote: "*Allocation of participants was performed by an investigator who was not involved in data collection.*"
Blinding of participants and personnel (performance bias) All outcomes	High risk	Personnel were not blinded and it was impossible to blind runners to the footwear.
Blinding of outcome assessment (detection bias) All outcomes	High risk	Data collection was not blinded.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Study withdrawal reported with reasons unrelated to intervention.
Selective reporting (reporting bias)	Low risk	All outcomes in pre/published protocol are reported in results
Other bias	Low risk	We identified no other sources of bias

Knapik 2009

Study characteristics	
Methods	**Aim:** to determine whether injury risk can be reduced by selecting running shoes based on plantar type. **Design:** parallel group, quasi-RCT. Randomisation, to either running shoe based on plantar shape or control group, was based on sequential ordering upon arrival for testing. No further detail provided. **Duration:** 9 weeks **Centres and locations:** Fort Jackson, S.C, USA. **Methods of recruitment:** US Army recruits participating in Basic Combat Training were enrolled in the study. **Start/End dates:** March to July 2007. **ITT:** no ITT analysis.
Participants	**Number:** 3952. **Inclusion criteria:** enrolled in Basic Combat training.

Knapik 2009 *(Continued)*

	Exclusion criteria: did no@or could no@o J@5in@he preWcriJed Whoe. 4 id no@ Wve5r@he preWcriJed Whoe for 5ll of@he B5Wic ComJ5@Tr5ining. **Age:** me5n m5le 23 ±S4 6 ye5rW, fem5le 23 ±S4 6 ye5rW **Gender:** male 2689, female 1263. **Baseline imbalances:** O5Weline ch5r5c@eriW@icW no@ repor@ed. **Withdrawals:** 264: 257 (19%), male intervention, (20%); male control; 165 (26%); female intervention, 147 (23%); female control.
InterventionW	**Running5s12e5based52n5plantar51ape** (low 5rch w5W provided wi@h mo@ion con@rol WhoeW, high 5rch w5W provided wi@h cuWhion@ype WhoeW 5nd norm5l 5rch w5W provided wi@h W@5Jili@y WhoeW) **(interven/tion)** N = 1979. **Stability Shoes (control)** N = 1973. 4 e@5ilW of Whoe Wve5r 5re provided in Table 2. **Schedule:** O5Wic ComJ5@Tr5ining W deWcriJed in US Army Tr5ining 4 oc@ine 5nd Comm5nd Regul5/@on. PhyWic5l @r5ining WeWWionW were performed from 1 @o 1.5 hourW 4 @o 6 d5yW per week. SeWWionW 5l/@ern5@ed Je@ween c5rdioreWpir5@ory 5nd muWcle W@reng@h d5yW. C5rdioreWpir5@ory d5yW involved diW/@5nce running 0.5 @o 3 mileW 5nd/or Wprin@ing. Wome puWh/upW 5nd Wi@/upW. Four running 5Jili@y groupW were formed in e5ch comp5ny J5Wed upon @he diWcriJu@ion of run WcoreW on @he firW@ @i@neWW @eW@. MuWcle W@reng@h d5yW involved 5 v5rie@y of puWh/upW 5nd Wi@/upW in 5ddi@ion @o o@her 5rmy @r5ining drillW. No ef/for@ w5W m5de @o @eW@ic @he Wve5ring of running WhoeW @o phyWic5l @r5ining 5nd no mech5niWm w5W in pl5ce @o record how long WuJjec@W wore @heir running WhoeW during diWcre@ion5ry @ime.
OutcomeW	**Primary:** five injury indiceW in W5ll5@on Injury Index, Modified inW5ll5@on Injury Index, OveruWe Injury Index, Tr5ining Injury Index, ComprehenWive Injury Index (CII). All 5re injury incidenceW (injurieW/1000 perWon/d5y) J5Wed on @he ICD/9/CM. **Secondary:** none. **Injury defined as:** no defini@on provided. However, 5ll indiceW include Wpecific ICD/9/CM codeW
No@eW	**Study5funder5and52ntributi2n:** no fin5nci5l diWcloWureW were repor@ed. **62nfli4ts52f5interest:** none reported.

Risk of bias

Bias	Authors' judgement	Supp2rt52r5judgement
Random sequence genera/tion (selection bias)	High risk	Me@hod of Wequence gener5@on w5W in Wequen@5l order of 5rriv5l for @eW@ng. Quo@e: "*Subje,ts&we[e&andLmized&ntL&a&Lnt[Ll&G)&[&expe[imental&E)&[Lup&n sequential&[de[&alte[natively&n&[de[&f&a[[ival&L[&esting).*"
Allocation concealmen@ (selection bias)	High risk	Me@hod of 5lloc5@on conce5lmen@ no@ W@5@ed Ju@ p5r@cip5n@W 5lloc5@ed Jy 5 researcher. Quo@e: "*A&membe[&f&ze&study&eam&assu[ed&zat&a,z&e[sLn&ele,ted&ze&[eNs,[ibed&zLe&ype&and&was&itted&witz&ze&[Lpe[&zLe.*"
Blinding of participantW and personnel (perfor/mance bias) All outcomeW	High risk	PerWonnel were no@ Jlinded 5nd i@ w5W impoWWiJle @o Jlind runnerW @o @he foo@we5r.

Knapik 2009 *(Continued)*

Blinding of outcome as/sessment (detection bias) All outcomeW	Unclear risk	I@w5WOncle5rOfd5@5Oollec@onw5WOlinded.
Incomplete outcome dat5 (attrition bias) All outcomeW	Unclear risk	S@udyOwi@hdr5w5lOepor@dOwi@hOe5WonWSomeOp5r@cip5n@Wwi@hdrewOec5uWe ofWhoeOdiWcomfor@Ou@OumJerWOreOncle5r.
Selective reporting (re/porting bias)	Unclear risk	NoOpre/puJliWhedOpro@col,OhoweverOllOu@comeWOnOme@hodOwereOepor@ed.
Other biaW	LowOiWk	WeOden@fiedOoO@herOWourceWOfOi5W

Knapik 2010a

StudyOh5r5c@eri@ic@s	
MethodW	**Aim:**@oOde@ermineOwhe@herOnjuryOiWkO5nOeOeducedOnO5WcOmili@ryO@5iningOyOWelec@ngOunning WhoeWO5WedOnOpl5n@5rO@ypeO5ndO@oOex5mineOiWkOf5c@orWOorOnjuryOnO5WcOmili@ryO@5ining. **Design:**Op5r5llelOgroup,Oqu5Wi/RCT.OR5ndomiW5@on,O@oOei@herO5OunningOWhoeO5WedOnOpl5n@5rOWh5peOor con@olOgroup,Ow5WO5WedOnOWequen@5lOrderingOuponO5rriv5lOforO@eW@ng.ONoOfur@herOde@5ilOprovided. **Duration:** 4 months. **Centres and locations:**O5ckl5ndOAirOForceOB5We,OTex5WOUSA. **Met12d52f5re4ruitment:**OUSO5irOforceOecrui@WOp5r@cip5@ngOnOB5WcOMili@ryOTr5iningOwereOenrolledOn @heOW@udy. **Start/End5dates:**OM5rchO@oOulyO2007. **ITT:** no ITT analysis.
ParticipantW	**Number:** 3021. **Inclusion criteria:** enrolled in Basic Military Training. **Exclusion criteria:**OdidOnoOen@erOB5WcOMili@ryOTr5iningOforO5dminiW@5@veOorOmedic5lOe5WonWOorOdid noOcomple@eO@heOB5WcOMili@ryOTr5ining. **Age:**OnoOprovidedOu@Wpli@OnOoO18O@oO19,O20O@oO24O5ndO25Oye5rWOorOH5z5rdOR5@oO5n5lyWiW **Gender:** male 2167, female 854. **Baseline imbalances:**OnoOWignific5n@OdifferenceWOe@weenOexperimen@5lO5ndOcon@olOgroupWOforOweigh@, BMI,OpuWh/upW,OcruncheWO5ndO1.5OmileOun.OForO@heOv5ri5JleOr5ce,O@heOexperimen@5lOgroupOmenOh5dOmore Jl5ckOecrui@WO@h5nO@heOcon@olOgroupOmen. **Withdrawals:**O319O(11%)OofO@heOni@5lOW5mple.OOfO@heOem5iningO2702,O8.9%OnO@heOn@erven@onOgroup 5ndO8.2%OnO@heOcon@olOgroupOofOm5leWO5ndO16.0%OofO@heOn@erven@onOgroupO5ndO11.3%OofO@heOcon@ol groupOofOfem5leWOwi@hdrewOfromO@5ining.
InterventionW	**Running512e5based52n5plantar51ape**OlowO5rchOw5WOprovidedOwi@hOmo@onOcon@olOWhoeW,OhighO5rch w5WOprovidedOwi@hOcuWhionO@ypeOWhoeWO5ndOnorm5lO5rchOw5WOprovidedOwi@hOW@5Jili@yOWhoeWO**(interven,tion)** N = 1258. **Stability shoe (control)** N = 1415. 4e@5ilWOfOfoo@we5rO5reOprovidedOnOTable 2.

Knapik 2010a *(Continued)*

	Schedule: basic military training.
OutcomeW	**Primary:** five injury indiceW: The InW5ll5@on Injury Index, The Modified InW5ll5@on Injury Index, The OveruWe Injury Index, The Tr5ining Injury Index, The ComprehenWive Injury Index (CII). All 5re injury inci/denceW (injurieW/1000 perWon/d5y) J5Wed on @he IC4/9/CM. **Secondary:** none. **Injury defined as:** no defini@on provided. However, 5ll indiceW include Wpecific IC4/9/CM codeW
No@eW	**Study5funder5and542ntributi2n:** no fin5nci5l diWcloWureW were repor@ed. **62nfli4ts52f5interest:** none reported. **Correspondance:** The 5u@hor confirmed @he W5mple WizeW of m5le 5nd fem5le p5r@cip5n@W

Risk of bias

Bias	Authors' judgement	Supp2rt5f2r5judgement
Random sequence genera/tion (selection bias)	High risk	Me@hod of Wequence gener5@on w5W in Wequen@5l order of 5rriv5l for @eW@ng. Quo@e: "*Study pa[ti, ipants we[e andLmly assigned L eitze[an expe[imental (E) L [a Lnt[Ll (G) g[Lup, based Ln [de[f a[[ival L [testing.*"
Allocation concealmen@ (selection bias)	High risk	Me@hod of 5lloc5@on conce5lmen@ no@ W@5@ed. However, Weem predic@5Jle 5nd iW no@ Jlinded.
Blinding of participantW and personnel (perfor/mance bias) All outcomeW	High risk	Uncle5r if perWonnel were Jlinded 5nd i@ w5W impoWWiJle @o Jlind runnerW @o @he foo@we5r.
Blinding of outcome as/sessment (detection bias) All outcomeW	Unclear risk	I@ w5W uncle5r if d5@5 collec@on w5W Jlinded.
Incomplete outcome dat5 (attrition bias) All outcomeW	Unclear risk	S@udy wi@hdr5w5l numJerW repor@ed Ju@ uncle5r on re5WonW
Selective reporting (re/porting bias)	Unclear risk	No pre/puJliWhed pro@ocol, however 5ll ou@comeW in me@hod were repor@ed.
Other biaW	Low riWk	We iden@fied no o@her WourceW of Ji5W

Knapik 2010b

Study5h55acte55st5s

MethodW	**Aim:** @o de@ermine whe@her injury riWk c5n Je reduced in M5rine CorpW J5Wic mili@5ry @5ining Jy 5WWign/ing running WhoeW J5Wed on W@5@c weigh@ Je5ring pl5n@5r foo@ Wh5pe. **Design:** p5r5llel group, RCT. AWWignmen@ order r5ndomly gener5@ed Jy W@5@W@c5l Wof@w5re pro/gramme. **Duration:** 12 weekW

Knapik 2010b *(Continued)*

	Centres and locations: M5rine CorpW Recrui 4 epo , S5n 4 iego, C5liforni5 5nd P5rriW IW5nd, Sou h C5r/olin5, USA. **Met12d5 2f5 re4ruitment:** US M5rine CorpW recrui W p5r icip5 ing in B5Wic Tr5ining were enrolled in he W udy. **Start/End5 dates:** no repor ed. **ITT:** no ITT analysis.
ParticipantW	**Number:** 1611. **Inclusion criteria:** enrolled in Uni ed S 5 eW B5Wic M5rineW CorpW Tr5ining. **Exclusion criteria:** none reported. **Age:** unclear. **Gender:** male 917, female 694 **Baseline imbalances:** m5le in erven ion group; Wignific5n ly more p5r icip5n W h5d 5 prior lower/limJ injury comp5red wi h he m5le con rol group. **Withdrawals:** 20 (4%); male intervention, 45 (15%); male control; 57 (15%); female intervention; 24 (6%); female control.
InterventionW	**Running5 s12e5 based5 2n5 plantar5 s1ape** (low 5rch w5W provided wi h mo ion con rol WhoeW; high 5rch w5W provided wi h cuWhion ype WhoeW 5nd norm5l 5rch w5W provided wi h W5Jili y WhoeW) **(interven/tion)** N = 803. **Stability Shoes (control)** N = 751. 4 e 5ilW of foo we5r 5re provided in Table 2. **Schedule:** basic military training.
OutcomeW	**Primary:** five injury indiceW; The InW5ll5 ion Injury Index, The Modified InW5ll5 ion Injury Index, The OveruWe Injury Index, The Tr5ining Injury Index, The ComprehenWive Injury Index (CII). All 5re injury inci/denceW (injurieW/1000 perWon/d5y) J5Wed on he IC4 /9/CM. **Secondary:** none. **Injury defined as:** no defini ion provided. However, 5ll indiceW include Wpecific IC4 /9/CM codeW
No eW	**Study5 funder5 and5 42ntributi2n:** no fin5nci5l diWcloWureW were repor ed. **62nfli4ts5 2f5 interest:** none reported.

Risk of bias

Bias	Authors' judgement	Supp2rt5 f2r5 judgement
Random sequence genera/tion (selection bias)	Unclear risk	Me hod of Wequence gener5 ion w5W gener5 ed uWing W5 iW ic5l Wof w5re. Quo e: "FLllLwing all LLt measu[ements, pa[ti ipating e [uits we[e andLmNized ntL L f2 g[Lups using an assignment [de[z at was andLmly gene[ated by a statisti al Lftwa[e p[Lg[am." However, J5Weline differenceW in previouW injury exiW ed J e ween groupW 5nd previouW injury iW 5 W rong predic or of incre5Wed injury riWk.
Allocation concealmen (selection bias)	Unclear risk	Me hod of 5lloc5 ion conce5lmen uncle5r.

Knapik 2010b *(Continued)*

Blinding of participantW and personnel (perfor/mance bias) All outcomeW	High risk	Uncle5rOfperWonnelOwereOlindedOndO@w5WmpoWiJle@oOlindOunnerW@o@he foo@we5r.
Blinding of outcome as/sessment (detection bias) All outcomeW	Unclear risk	I@w5WOncle5rOfd5@5Oollec@onOw5WOlinded.
Incomplete outcome dat5 (attrition bias) All outcomeW	LowOiWk	S@udyOwi@hdr5w5lOepor@dOwi@hOe5WonWOnrel5@dO@Oin@erven@on.
Selective reporting (re/porting bias)	Unclear risk	NoOpre/puJliWhedOpro@col,OhoweverOllOou@comeWOnOne@hodOwereOepor@ed.
Other biaW	LowOiWk	WeOden@fiedOnoO@herOourceWOfOi5W

Malisoux 2016a

Study characteristics	
MethodW	**Aim:** @o@de@ermineOwhe@herO@heOdropOofOW5nd5rdOuWhionedOunningOWhoeWOnfluenceWOunningOnjury riWk. **Design:** Op5r5llelOgroupWORCT.OExperienceOwi@hOninim5liWOunningOWhoeWO(dropO<10Omm)OuWedO@oOW@5@fy p5r@cip5n@WOforO5ndomiW5@on.OBlockO5ndomiWed (OlockOWze=60). **Duration:** 6 months. **Centres and locations:** OSpor@WMedicineOeWe5rchO5Jor5@ory,OuxemJourgOnW@@u@eOofOe5l@h.ORecrui@/men@OfromOuxemJourg,OFr5nce,OBelgiumO5ndOGerm5ny. **Met12d52f5re4ruitment:** via public advertisement in local newspapers. **Start/End5dates:** OW@udyOenrolmen@OSep@emJerO@o4ecemJerO2014. **ITT:** ITT analysis after 6 months.
ParticipantW	**Number:** O577;O410OGroupO190;O46OGroupO194;O40OGroup 193. **Inclusion criteria:** OgoodOhe5l@h,O18O@oO65Oye5rWOld,OnoOuWeOofOninim5liWOWhoeWO(<O4OmmOdrop)OnOprevi/ouWO12OmonthWOnoOon@5indic5@onWO@oOunning,OnoOWurgeryO@oO@heOowerOimJWOrOowerO5ckOnO@heO5W@ 12OmonthWO5ndOnoOuWngOrthop5edicOnWoleWOwhenOunning. **Exclusion criteria:** Ono@OW5@ed. **Age:** O410OGroupO38.3O±O40.7Oye5rWO46OGroupO38.0O±O40.6Oye5rWO40OGroup 38.6O±O40.9Oye5rW **Gender:** O410OGroupO106Om5leW,O70Ofem5leWO46OGroupO11Om5leW,O79Ofem5leWO40OGroupO124Om5leW,O63Ofe/males. **Baseline imbalances:** small variation in gender distribution. **Withdrawals:** O410OGroup 14O(7%);O46OGroupO4O(2%);O40OGroupO6O(3%).
InterventionW	**Neutral / cushioned shoes (intervention)** O410Ogroup,OuW@omOunningOWhoeOwi@hO10OmmOdropOe@ween rearfoot and forefoot.

Malisoux 2016a *(Continued)*

	Minimalist shoes (control)@4 6@groupW@uW@omOunningOWhoeWOwi@hO6OmmOdropOe@weenOhe5rfoo@OOnd forefoot. **Minimalist shoes (control)**@4 0@group,@uW@omOunningOWhoeWOwi@hO0OmmOdropOe@weenOhe5rfoo@OOnd forefoot. **Schedule:**OWpor@OOp5r@icip5n@OOndOdverWe@evenOWOinjurieWOp5inOndOllneWWOcollec@edO@hroughou@O@he intervention period (6 months) using an online platform. Addition information on training sessions col/lec@ed,OncludingOnform5@onOnO@ypeOfOc@ivi@y,Odur5@on,Operceived@n@enWi@yO(0O@o 10),OdiW@nceOov/ered,OunningOWurf5ce,OWhoeWOuWedOndOp5inOduringOc@ivi@y.
OutcomeW	**Primary:** number of runners who sustained a running-related injury, characteristics of injuries (loca/tion, type, severity, recurrence, category). **Secondary:** none. **Injury defined as:**OphyWic5lOp5inOoc5@edOnO@heOowerOimJWOrOowerOO5ck,OuW@inedOduringOrOW@Oe/WulOOfOunningOpr5c@ceOndOmpedingOpl5nnedOunningOc@ivi@yOforOO@e5W@One d5yO(@ime/loWWOdefini/tion).
No@eW	**Study5funder5and542ntributi2n:**O@heOW@udyOw5WOofundedOOyO4 ec5@hlon,OwhoOlWoOprovidedOfoo@we5rOfor @heOW@udy. **62nfli4ts52f5interest:**OoneOrOmoreOfO@heOu@horWOdecl5redOpo@en@5lOconflic@OfOn@ereW@OrOWourceOdue @O@heOfundingOWource.OTheOW@udyOw5WOofundedOOyO@heOMovemen@OScienceW@4 ep5r@men@,O4 ec5@hlon,OVil/leneuveOd'AWcq,OFr5nce.OOneOu@horOWemployedO@O4 ec5@hlon.

Risk of bias

Bias	Authors' judgement	Supp2rt52r5judgement
Random sequence genera/tion (selection bias)	LowOiWk	TwoOpre/eW@5JliWhedO5ndomiW@@onOiW@WOwereOuWedO(OlockOWizeO60)OO5WedOon previouWOexperienceOfOow/dropOunningOWhoe. Quo@e:O"*Pa[ti, ipants&wzL&p[esented&a&pai[&f&zLes&witz&a&d[Lp&less&zan&10&mm we[e&lassified&as&pa[ti, ipants witz&p[eviLus&expe[ien, e&witz&LwN&d[Lp&unning&zLes.*" Quo@e:O"*P[eviLus&expe[ien, e&witz&LwN&d[Lp&unning&zLes&(LwN&d[Lp&expe[ien, e) was&uggested&L&be&a&LnfLunding fa, tL[&L[&nju[y&isk.3&Tze[efL[e,&at&ze&nLment&f&e, [uitment,&eligible&pa[ti, iN pants&we[e&t[atified&a, , L[ding tL&zei[&LwN&d[Lp&expe[ien, e&(\10&mm).&TwL&p[eNestablisz ed&andLmizatiLn&lists (blL, k&ize&&60)&we[e&zus&used&L&allL, ate&ze&&zLe&e[siLns&andLmly&L&ze participants*."
Allocation concealmen©(selection bias)	Unclear risk	Me@hodOfOlloc5@onOconce5lmen@Ono@OW@@edOu@OWhoeWOwereOcodedOyOneOe/We5rcherOno@OnvolvedOnOd5@OOcollec@on. Quo@e:O"*Ea, z&zLe&pai[&was&Lded&by&a&LwL[ke[&aLt&nvLlved&n&ze&study&befL[e the distribution.*"
Blinding of participantW and personnel (perfor/mance bias) All outcomeW	High risk	ThereOW@nO@empO@OOlindOunnerWO@O@heO@ypeOfOWhoeO@heyOwereOgivenOyOde/iden@fyingO@heOr5ndOfOWhoe.OHoweverO@heOu@horWO5@erOcknowledgeO@h5© runnerWOcouldOe5WOn5JlyOworkOu@OfO@heyOh5dOeceivedOOdifferen@OWhoeOdrop @O@heirOorm5lOWhoe.
Blinding of outcome as/sessment (detection bias) All outcomeW	LowOiWk	AWWeWWorWOfOu@comeOWWeWWmen@OwereOOlindedO@OWhoeOlloc5@on.

Malisoux 2016a *(Continued)*

Incomplete outcome dat5 (attrition bias) All outcomeW	Unclear risk	S@udy@wi@hdr5w5l@epor@ed@wi@h@e5W@nW@h5@m5y@e@el5@ed@o@n@erven@on, for@x5mple@p5r@cip5n@W@did@no@@W@@udy@hoeW@p5r@cip5n@W@uffered@rom J@iW@erW@5uW@d@y@he@hoe.@u@@ncle5r@how@n5ny@were@rom@he@n@erven@on 5nd@on@ol@groupW
Selective reporting (re/ porting bias)	Unclear risk	No@pre/puJliWhed@pro@col,@however@5ll@ou@comeW@n@me@hod@were@epor@ed.
Other biaW	Low@iWk	We@den@fied@no@@her@ourceW@of@i5W

Malisoux 2016b

Study@h@@@cte@@t@s	
MethodW	**Aim:**@o@de@ermine@whe@her@no@on@on@ol@unning@hoeW@modify@unning@njury@iWk@nd@whe@her@he influence@of@heW@unning@hoeW@W@dependen@upon@oo@@ype. **Design:**@5r5llel@group,@RCT.@roup@lloc5@on@5W@d@upon@W@5@fic5@on@y@ge,@MI@nd@oo@@ype. **Duration:** 6 months. **Centres and locations:**@por@@Medicine@ReW@5rch@5Jor5@ory,@uxemJourg@nW@@u@e@of@e5l@h.@Recrui@men@from@uxemJourg,@r5nce,@elgium@nd@erm5ny. **Met12d5f5re4ruitment:** via public advertisement in local newspapers. **Start/End5dates:**@@udy@nrolmen@@M5rch@o@April@2014.@n@erven@on@eriod:@une@o@4ecemJer@2014. **ITT:** ITT analysis after six months.
ParticipantW	**Number:** 423; Motion control 211; Neutral / cushioned 212. **Inclusion criteria:**@good@he5l@h,@18@o 65@e5rW@ld,@no@uW@of@minim5liW@@hoeW@(<4@mm@drop)@n@pre/viouW@12@mon@hW@no@on@5indic5@onW@o@unning,@unning@5@@e5W@once@@week@n@he@@mon@hW@pre/ceding@he@@udy,@no@urgery@o@he@ower@imJW@r@ower@5ck@n@he@5W@12@mon@hW@nd@no@@W@ng@r/thopaedic insoles when running. **Exclusion criteria:**@o@@W@@ed. **Age:**@Mo@on@on@ol 39.9@@4 9.7@e5rW@Neu@5l@u@hioned@41.0@@4 11.2@e5rW **Gender:** motion control: male 11, female 76; Neutral / cushioned: male 113; female 72. **Baseline imbalances:** none. **Withdrawals:** motion control 4 (2%); Neutral / cushioned 10 (5%)
InterventionW	**Motion control (intervention)** commercially available motion control running shoe featuring 10 mm heel/@o/@e@drop,@hermopl5W@c@polyure@h5ne@@uc@ure@wi@hin@he@midfoo@@nd@du5l@enW@y@EVA@mid/sole. **Neutral / cushioned (control)** commercially available neutral / cushioned running shoe featuring 10 mm@heel/@o/@e@drop,@den@c5l@o@no@on@on@ol@hoe@eW@deW@e5@ureW@de@5iled@Jove. **Schedule:**@por@@p5r@cip5n@@nd@dverW@@ven@@injurieW@5in@nd@llneW@collec@ed@hroughou@@he intervention period (6 months) using an online platform. Addition information on training sessions col/lected, including information on type of activity, duration, perceived intensity (0 – 10), distance cov/ered,@unning@urf5ce,@hoeW@W@d@nd@5in@during@c@vi@y.

Malisoux 2016b *(Continued)*

OutcomeW	**Primary:** number of runners who sustained a running-related injury, characteristics of injuries (loca/tion, type, severity, recurrence, category). **Secondary:** none. **Injury defined as:** ©phyW©c5l©p5in©oc5©ed©n©he©ower©imJW©or©ower©5ck,©uW©5ined©during©or©W©©e/Wul©©of©running©pr5c©ce©5nd©mpeding©pl5nned©running©c©vi©y©for©5©©e5W©©one d5y©©me/loW©©defini/tion).
No©eW	**Study5funder5and542ntributi2n:** ©he©W©udy©w5W©cofunded©y©4 ec5©hlon,©who©5lW©©provided©oo©we5r©for ©he©W©udy. **62nfli4ts52f5interest:** ©ne©or©more©of©he©5u©hor©W©decl5red©po©en©5l©conflic©©of©n©ereW©©or©Wource©due ©©©he©funding©Wource.©he©W©udy©w5W©cofunded©y©©he©Movemen©©ScienceW©4 ep5r©men©,©4 ec5©hlon,©il/leneuve©d'AW©q,©r5nce.©hree©5u©hor©W©were©employed©©©4 ec5©hlon. **Correspondence:** ©he©5u©hor©confirmed©he©5JW©5c©found©n©our©e5rch©w5W©h5©©of©he©full©5per©n/cluded©W©M5liW©oux©2016J.

Risk of bias

Bias	Authors' judgement	Supp2rt52r5judgement
Random sequence genera/tion (selection bias)	Unclear risk	Me©hod©of©equence©gener5©on©no©©©©ed©u©©W©ed©©5©fic5©on©y©on/founder©©5ge,©BMI©5nd©oo©©morphology). Quo©e:©"*Pa[ti, ipants&we[e&andLmly&allL, ated&L&ne&f&ze&wL&zLe&nLdels&n a, , L[dan, e&witz&t[atifi, atiLn&by&pLtential&LnfLunde[s&age&and&bLdy&mass&nN dex&BMI);&utNLff&values&a[e&medians)&and&LLt&nL[pzLLLgy*."
Allocation concealmen© (selection bias)	Unclear risk	Me©hod©of©5lloc5©on©conce5lmen©©no©©©©5©ed.©Bu©©©©w5W©©©5©ed©©h5©©©hoe©diW© ©iJu©or©©were©linded. Quo©e:©"*Participants and assessors involved in the shoe distribution and particiN pant&LllLwNup&we[e&bLtz&blinded&ega[ding&ze&zLe&allL, atiLn*."
Blinding of participantW and personnel (perfor/mance bias) All outcomeW	High risk	Uncle5r©©f©per©onnel©were©linded.©©©w5W©mpo©W©J le©©©lind©runner©©©©he foo©we5r.©However©©here©w5W©©5n©5©©emp©©©©lind©runner©©©©he©ype©of©hoe ©hey©were©given©y©de/iden©fying©he©r5nd©of©he©hoe.
Blinding of outcome as/sessment (detection bias) All outcomeW	Unclear risk	Uncle5r©f©d5©5©collec©on©w5W©linded.
Incomplete outcome dat5 (attrition bias) All outcomeW	Unclear risk	S©udy©wi©hdr5w5l©repor©ed©wi©h©©e5W©nW©u©©uncle5r©f©el5©ed©©©hoe©5lloc5/©on©(e.g.©did©no©©©W©©hoe©for©more©h5n©wo©e©W©onW).
Selective reporting (re/porting bias)	Unclear risk	No©pre/puJliW©hed©pro©ocol,©however©5ll©ou©comeW©n©me©hod©were©repor©ed.
Other biaW	Low©iW©	We©den©fied©no©o©her©ourceW©of©i5W

Malisoux 2020

Study©h©©©cte©©t©s

Malisoux 2020 *(Continued)*

MethodW	**Aim:** o inveW g5 e of hoe uW hioning nd ody m5W re W ci5 ed wi h unning njury iWk n ecre/ 5 on5l unnerW nd whe her here W n W ci5 on e ween hoe uW hioning nd njury iWk W nflu/ enced y ody m5W **Design:** p5r5llel group, RCT. Group lloc5 on 5W d upon 5 fic5 on y gender lock 5 fied n blocks of 40). **Duration:** six months. **Centres and locations:** Spor Medicine ReWe5rch 5Jor5 ory, LuxemJourg nW u e of He5l h. Recrui men from LuxemJourg, Fr5nce, Belgium nd Germ5ny. **Met12d 2f re4ruitment:** via public advertisement in local newspapers. **Start/End dates:** udy enrolmen Sep emJer 2017 o 5nu5ry 2018. **ITT:** ITT analysis after six months.
ParticipantW	**Number:** 874; Soft 438, H5rd 436. **Inclusion criteria:** good he5l h, 18 o 65 ye5rW old nd 5p5Jle of unning for 15 minu eW onWecu vely. **Exclusion criteria:** on 5indic5 onW o unning, ower mJ or 5ck urgery n he 5W 12 mon hW, uWe of orthopaedic insoles when running or running-related injury in the month before enrolment. **Age:** Soft 40.4 ± S4 10.2 ye5rW; H5rd 40.5 ± S4 9.8 ye5rW **Gender:** Soft: m5le 259, fem5le 169; H5rd: m5le 260, fem5le 160. **Baseline imbalances:** none. **Withdrawals:** Soft 10 (2%); H5rd 16 (4%).
InterventionW	**S2ft 12es (interventi2n)** oft ole wi h ffneWW of 61.3 ± 2.7 N/mm, den c5l o h5rd unning hoe in all other areas. **Hard 12es (42ntr2l)** h5rd ole wi h ffneWW of 94.9 ± 5.9 N/mm, 337 ± 17 g m5WW, heel/ o/ oe drop 10 mm, 5ck heigh 5 he heel 34 mm. **Schedule:** Spor p5r cip5n nd dverWe even injurieW, p5in nd llneWW colle ed hroughou he intervention period (6 months) using an online platform. Addition information on training sessions col/ lec ed, ncluding nform5 on on ype of c vi y, dur5 on, perceived n enW y (0 o 10), diW nce cov/ ered, unning urf5ce, hoe uWed nd p5in during c vi y.
OutcomeW	**Primary:** number of runners who sustained a running-related injury, characteristics of injuries (loca/ tion, type, severity, recurrence, category). **Secondary:** none. **Injury defined as:** unning/rel5 ed (5ining or ompe on) muWculoWkele 5l p5in n he ower mJW h5 5uWeW reW ic on n or pp5ge of unning (diW nce, peed, dur5 on, or 5ining) for 5 e5W even d5yW or hree onWecu ve cheduled 5ining eWWionW, or h5 requireW he unner o onWul 5 phyWici5n or o her he5l h profeWWion5l.
No eW	**Study funder and 42ntributi2n:** none reported. **62nfli4ts 2f interest:** none reported.

Risk of bias

Bias	Authors' judgement	Supp2rt f2r judgement

Malisoux 2020 *(Continued)*

Random sequence generation (selection bias)	Low@iWk	Two@re/eW5JliWhed@5ndomiW5@on@iWW@for@5le@nd@em5le@unnerW@lock Wze:@@40)@rep5red@y@5W@W@ci5n@o@nvolved@n@he@@udy.@unnerW@ere W@5@fied@ccording@o@ex. Quo@e:@*Tze@a[ti, ipants&we[e&t[atified&, , L[ding&L&zei[&ex,&as&t&nfluen, es bLdy&mass&and&tze[&antz[LpLmet[i, &za[a, te[isti, s.&Tz us,&&p[eNestabliszed [andLmizatiLn&ists&fL[&male&and&emale&a[ti, ipants;&lL, k&ize:&&&40)&we[e p[epa[ed&by&&tatisti, ian&Lt&nvLlved&n&any&tze[&a[t&Lf&tze&study&and&used&L allL, ate&&Lf&tze&2&zLe&ve[siLns&L&ea, z&a[ti, ipant."*
Allocation concealment (selection bias)	Unclear risk	The@hoe@ere@oded@y@@on/involved@o/worker@efore@iW@iJu@on.@u@5l/location concealment is unclear. Quo@e:@*Ea, z&zLe&ai[&was&Lded&by&&LninvLlved&LwL[ke[&efL[e&dist[ibution."*
Blinding of participants and personnel (performance bias) All outcomes	High risk	Uncle5r@f@erWonnel@ere@linded.@@w5W@mpoW@Jle@o@lind@unnerW@o@he foo@we5r.@owever@here@w5W@n@@emp@@o@lind@unnerW@o@he@ype@f@hoe @hey@ere@iven@y@de/iden@fying@he@r5nd@f@he@hoe.
Blinding of outcome assessment (detection bias) All outcomes	Low@iWk	The@hoe@ode@w5W@roken@f@er@he@omple@on@f@5@5@ollec@on.@herefore d5@5@ollec@on@w5W@linded.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	S@udy@i@hdr5w5l@epor@d@i@h@e5Wonw@nrel5@ed@o@n@erven@on.@owever, l5rge@ropor@on@f@5@5@n5lyWed@w5W@igh@en@red@i@hou@@xpl5n5@on.
Selective reporting (reporting bias)	Unclear risk	All@njury@u@comeW@re@epor@ed.@owever,@iomech5nic5l@e5WureW@5@ed@n @he@ro@ocol@re@iWWng@rom@uJliWhed@ri5l.
Other bias	Low@iWk	We@den@fied@o@@her@ourceW@f@i5W

Mars1all52013

Study characteristics	
Methods	**Aim:**@o@e@ermine@f@he@r5du5l@5nW@on@rom@onven@on5l@neu@5l/@uWhioned)@unning@hoeW@o minim5liW@unning@hoeW@ncre5Wed@he@iWk@f@ower/limJ@5in@r@njury@nd@mproved@ower/limJ@uWcle function in experienced distance runners. **Design:**@5r5llel@roup,@CT.@5r@cip5n@@ere@@5@fied@y@unning@xperience@nd@ge.@roup@lloc5/@on@w5W@e@ermined@y@oin@o@W@he5dW@n@erven@on;@ilW@on@ol). **Duration:**@2@weekW **Centres and locations:**@or@@liz5Je@h,@ou@h@fric5. **Met12d52f5re4ruitment:**@5r@cip5n@@ere@hen@ecrui@ed@or@he@@udy.@5r@cip5n@@ere@ecrui@ed @hrough@ord/of/mou@h@nd@dver@Wemen@@n@5ceJook,@@unning@luJW@nd@@he@elWon@5ndel5 Me@opoli@5n@niverW@y@n@or@@liz5Je@h. **Start/End5dates:** unclear. **ITT:**@1@5r@cip5n@@5ndomiWed,@nly@29@n@he@in5l@n5lyWW@o@TT.
Participants	**Number:** 29.

Marshall 2013 *(Continued)*

	Inclusion criteria: healthy males 18 to 50 years in neutral/cushioned running shoes, running 20 to 60 km per week in the 6 months prior to the study, running experience ≥ 2 years **Exclusion criteria:** participants who reported any relevant medical or surgical history, including a history of lower limb or lumbar/spine injury or pathology within the last three months prior to the study. Participants that were already running in minimalist running shoes increased Q angle (more than 14°) and a leg length discrepancy (discrepancy of more than 15 mm). Participants who took part in any races over 21.1 km during the study period. **Age:** neutral/cushioned shoes mean 33.3 (SD 8.3) years; minimalist shoes mean 32.9 (SD 7.5) years **Gender:** male. **Baseline imbalances:** no significant differences at baseline. **Withdrawals:** neutral / cushioned 2 (12.5%); 2 (6.5%); minimalist 0
Interventions	**Neutral / cushioned shoes (intervention)** N = 16; no detail provided. **Minimalist shoes (control)** N = 15; nov8. **Schedule:** participants in both groups performed calf muscle training (hopping) for four weeks. Participants in the experimental group also underwent a gradually progressive running four/week training programme that was designed to facilitate adaptation to running in minimalist shoes. The control group continued with their usual individual running training. In both groups participants continued with their usual individual running training after the four/week training programme.
Outcomes	**Primary:** number of running/related injuries after 12 weeks **Secondary:** location of injury, shoe satisfaction. **Injury defined as:** any reported muscle, joint or bone problem/injury of lower limb (i.e. buttock, hip, thigh, knee, shin, calf, ankle, foot, toes) resulting from running training that required the runner to miss at least one training day or training session.
Notes	**Study funders and contributions:** none stated. **Conflicts of interest:** none stated. **Correspondence:** the author confirmed the thesis had not been published in a peer/reviewed journal.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Method of sequence generation was a coin toss for the first allocation, then alternate groups from there. Quote: "A coin was then flipped to determine which group received the first participant. 'Heads' indicated that the experimental group received the participant. 'Tails' indicated that the control group received the participant."
Allocation concealment (selection bias)	Unclear risk	Method of allocation concealment not stated but an independent auditor was present to conduct and observe the procedure of allocation. Quote: "An independent auditor was present to conduct and observe the procedure."
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of runners was not completed. Runners in experimental group picked up shoes from a store whereas runners in the control group continued to use their own shoes. Personnel were not blinded.

Mars1all52013 *(Continued)*

Blinding of outcome as/ sessment (detection bias) All outcomeW	Unclear risk	Uncle5r@f d5@5 collec@on w5W lindeed.
Incomplete outcome dat5 (attrition bias) All outcomeW	Low@iWk	S@udy wi@hdr5w5l repor@ed wi@h re5WonW unrel5@ed @o in@erven@on.
Selective reporting (re/ porting bias)	Low@iWk	All ou@comeW in 5 proWpec@ve @i5l regiW@5@on documen@ 5re repor@ed in re/ sults.
Other biaW	Low@iWk	We iden@fied no o@her Wource of @i5W

Ryan52011

Study@h@@@cte@@t@s	
MethodW	**Aim:** @o comp5re @niWed @5ining d5yW 5nd running/rel5@ed p5in levelW e@ween neu@5l, W@5Jili@y 5nd mo@on con@ol Whoe W5 WigneD y foo@ poW@ure in fem5le runnerW **Design:** p5r5llel group RCT. UWing FPI runnerW were firW@ W@5@fied @o ei@her 5 neu@5l, pron5@ed or highly pron5@ed foo@ poW@ure group. The, WuJjec@W in e5ch foo@ poW@ure group were r5ndomly 5WWigned vi5 5 lock r5ndomiW5@on Wcheme—J lock Wize 3. R5ndom Wequence gener5@on 5nd group 5lloc5@on me@hod uncle5r. **Duration:** 13 weekW **Centres and locations:** University of British Columbia, Vancouver, Canada. **Met12d52f5re4ruitment:** Vi5 newWp5per 5dver@Wemen@ 5nd word of mou@h. **Start/End5dates:** unclear. **ITT:** @he 5u@horW W@5@ed 5n ITT 5n5lyWiW w5W uWed for comp5riWonW for Whoe @ype. A 5W@5lue c5rried forw5rd W@5@egy w5W uWed for miWWing d5@5 (due @o wi@hdr5w5lW reWul@ng from injury 5nd/or forgoing we5ring 5WWigned foo@we5r) in @he c5WeW where p5r@cip5n@W h5d repor@ed 5 minimum of @wo weekW of ou@come WcoreW However, WuJjec@W who repor@ed fewer @h5n @wo follow/up d5@5 poin@W were conWid/ ered dropou@W 5nd @heir d5@5 were omi@@ed for @he purpoWe of 5n5lyWiW Therefore, no@ 5 @rue ITT 5n5ly/ sis.
ParticipantW	**Number:** 81 **Inclusion criteria:** 18 @o 50 ye5rW, could run con@nuouWly for 30 minu@eW, h5d no hiW@ory of running in/ jurieW or foo@ or Whoe WuWge wi@hin @he preceding 3 mon@hW **Exclusion criteria:** hiW@ory of Wurgery @o @he lower ex@emi@y @h5@ would h5ve @he po@en@5l @o imp5c@ @heir running g5i@ 5nd if @here were 5ny known, or WuWpec@ed, degener5@ve condi@onW Wuch 5W oW/ teoarthritis or chondromalacia. **Age:** Neu@5l (cuWhioned) WhoeW (N=25): me5n 37 ± 4 9 ye5rW (neu@5l fee@), me5n 35 ± 4 7 ye5rW (pron5@ed fee@), me5n 27 ± 4 3 ye5rW (highly pron5@ed fee@). S@5Jili@y WhoeW (N=32): me5n 35 ± 4 5 ye5rW (neu@5l fee@), me5n 35 ± 4 9 ye5rW (pron5@ed fee@), me5n 26 ± 4 2 ye5rW (highly pron5@ed fee@). Mo@on con@ol WhoeW (24): me5n 38 ± 4 3 ye5rW (neu@5l fee@), me5n 34 ± 4 4 ye5rW (pron5@ed fee@), me5n 29 ± 4 6 ye5rW (highly pron5@ed fee@). **Gender:** female. **Baseline imbalances:** Wignific5n@ difference 5crowW Whoe c5@egorieW 5@ 5Weline for weigh@, BMI 5nd run/ ning experience.

Ryan52011 *(Continued)*

	Withdrawals: 24 (23%) wi@hdrew 5f@er enrolmen@; 2 (8%) of @heWe were due @o immedi5@e diW comfor@ or poor fi@ of running WhoeW. Of @he rem5ining 81 p5r@icip5n@W, 9 (11%) elec@ed @o wi@hdr5w from we5r/ ing @heir 5WWigned WhoeW 5nd re@urn @o @heir origin5l running foo@we5r; (neu@r5l/cuWhioned WhoeW: 4 (1 × neu@r5l fee@, 2 × pron5@ed fee@, 1 × highly pron5@ed fee@); W@5Jili@y WhoeW: 2 (2 × neu@r5l fee@); mo@ion con@rol WhoeW: 2 (2 × highly pron5@ed fee@)), 5nd @hree WuJjec@W who We@ @o wi@hdr5w due @o running/rel5@ ed p5in (mo@ion con@rol WhoeW: 2 (2 × highly pron5@ed fee@); neu@r5l/cuWhioned WhoeW: 1 (neu@r5l fee@)).
InterventionW	**Neutral / cushioned shoes:** N = 25 Nike Peg5WuW **Stability shoes:** N = 32 Nike S@uc@ure Tri5x (no@e: 12 r5ndomiWed Ju@ 13 followed/up in @he pron5@ed foo@ group) **Motion control shoes:** N = 24 Nike NucleuW **Schedule:** All p5r@icip5n@W were given one week @o gr5du5lly Jre5k in @he WhoeW for uWe wi@h running. Then runnerW underwen@ 5 13/week @r5ining progr5mme @5rge@ing 5 h5lf/m5r5@hon even@. The weekly volume W@5r@ed 5@ 5pproxim5@ely 20 km 5nd incre5Wed @o 40 @o 45 km 5@ @he pe5k of @he progr5mme.
OutcomeW	**Primary:** numJer of miWWed 5WWigned workou@W due @o running/rel5@ed p5in 5nd VAS i@emW for p5in 5@ reW@ (VASReW@), during 5c@ivi@ieW of d5ily living (VASA4L) 5nd during or immedi5@ely following running (VASRun) vi5 5@@end5nce 5@ weekly group runW 5nd uWing 5n online queW@ionn5ire. **Injury defined as:** miWWed @r5ining d5y due @o running/rel5@ed p5in.
No@eW	**Study5funder5and542ntributi2n:** Nike GloJ5l, One Bowerm5n 4rive, Be5ver@on, Oregon, USA. Nike C5n5d5 don5@ed clo@hing @o clinic le5derW 5nd Nike GloJ5l provided foo@we5r. **62nfli4ts52f5interest:** A reWe5rch p5r@nerWhip gr5n@ from Nike GloJ5l w5W 5w5rded @o MBR, JET 5nd KM @o conduc@ @hiW inveW@ig5@ion. GAV iW employed 5@ Nike GloJ5l.

Risk of bias

Bias	**Authors' judgement**	**Supp2rt52r5judgement**
Random sequence genera/ tion (selection bias)	Unclear risk	Me@hod of Wequence gener5@ion no@ W@5@ed. However, WuJjec@W in e5ch foo@ poW@ure c5@egory were r5ndomly 5WWigned vi5 5 Jlock r5ndomiW5@ion Wcheme —Jlock Wize 8) @o one of @hree foo@we5r condi@ionW Quo@e: "*Subje, ts&n&a, z&LLt&Lstu[e&ategL[y&we[e&zen&andLmly&assigned (via&a&blL, k&andLmisatiLn&, zeme—blL, k&ize&8)&L&ne&f&z[ee&LLtwea[&LndiN tions.*"
Allocation concealmen@ (selection bias)	Unclear risk	Me@hod of 5lloc5@ion conce5lmen@ no@ W@5@ed. Addi@ion5lly, differenceW in weigh@, BMI 5nd running experience 5@ J5Weline Je@ween groupW wi@h 5ll f5c/ @orW linked @o incre5Wed riWk of injury.
Blinding of participantW and personnel (perfor/ mance bias) All outcomeW	High risk	Uncle5r if perWonnel were Jlinded 5nd i@ w5W impoWWiJle @o Jlind runnerW @o @he foo@we5r.
Blinding of outcome as/ sessment (detection bias) All outcomeW	Unclear risk	Uncle5r if d5@5 collec@ion w5W Jlinded.
Incomplete outcome dat5 (attrition bias) All outcomeW	High risk	S@udy wi@hdr5w5l repor@ed wi@h re5WonW 5nd Wome were rel5@ed @o @he foo@we5r 5lloc5@ion.

Ryan5011 *(Continued)*

Selective reporting (re/porting bias)	Unclear risk	No@pre/puJliWhed@pro@ocol@v5il5Jle.
Other biaW	Low@iWk	We@den@fied@no@o@her@ourceW@of@i5W

Ryan5014

Study@h@@@cte@@t@s	
MethodW	**Aim:**@o@proWpec@vely@de@ermine@he@effec@of@wo@differen@minim5liW@foo@we5r@modelW@nd@one@con/ven@on5l@neu@5l/@uWhioned)@model,@on@njury@ncidence@nd@p5in@n@@popul5@on@of@ecre5@on5l@un/ners. **Design:**@p5r5llel@groupW@hree@rmW@proWpec@ve@RCT.@For@once5led@group@lloc5@on,@p5r@cip5n@W were@5ndomly@WWigned@y@@eWe5rcher@vi5@@compu@er/gener5@ed@lock@5ndomiW5@on@cheme—Jlock@ize@). **Duration:**@3@weekW **Centres and locations:** Vancouver, Canada. **Met12d52f5re4ruitment:**@i5@newWp5per@dver@Wemen@@nd@word@of@mou@h. **Start/End5dates:**@NovemJer@2011@for@12@weekW **ITT:**@ITT@n5lyWiW@Wed.@@5W@5lue@5rried@orw5rd@@5@egy@5W@Wed@or@miWWing@5@5@due@o@wi@h/dr5w5lW@eWul@ng@rom@njury@nd/or@or@going@we5ring@WWigned@oo@we5r)@n@he@5WeW@where@p5r@ci/p5n@@5d@epor@ed@@minimum@of@one@follow/up@ou@come@core.@P5r@cip5n@W@who@epor@ed@ewer@h5n one@follow/up@5@5@poin@Wwere@onWidered@drop/ou@W@nd@heir@5@5@were@mi@ed@or@he@purpoWe@of analysis.
ParticipantW	**Number:** 99. **Inclusion criteria:**@9@@@0@e5rW@eg5rdleW@of@he@unning@i@neW@evel,@ould@un@on@nuouWly@for@0 minu@eW@minimum@of@five ye5rW@unning@experience,@unning@n@@egul5r@5WiW@minimum@once@per week@over@5W@@@mon@hW),@ould@oler5@e@20@o@40@km/week@5ining@progr5mme,@5d@no@unning/re/l5@ed@njurieW@equiring@@@opp5ge@of@5ining@for@wo weekW@r@more@n@he@p5W@@x mon@hW@ee@5@e/gorised as "neutral", "supinated" or "pronated". **Exclusion criteria:**@urgery@o@heir@l5n@5r@5W@ci5@or@chilleW@endon,@i5gnoWiW@of@Weo5r@hri@W@r@o@h/er degenerative musculoskeletal disorder affecting the lower extremity, currently taking analgesic medic5@on,@lre5dy@Wing@minim5liW@unning@oo@we5r,@oo@poW@ureW@@@he@x@emeW@WWed@W@"highly pronated" or "highly supinated". **Age:**@eu@5l/@uWhioned;@4@@4 8@e5rW@5r@5l@Minim5liW@1@@4 7@e5rW@ull@Minim5liW@3@@4 8 ye5rW **Gender:** 39 male, 60 female. **Baseline imbalances:**@No@5Weline@mJ5l5nceW@l@hough@ v5lueW@re@o@provided. **Withdrawals:**@3@13%)@4@dropped@ou@@f@er@5Weline@WeWWmen@@2@f@er@he@@week@follow/up,@2@f@er @he@4/week@follow/up@nd@@f@er@he@/week@follow/up).
InterventionW	**Neutral / cushioned shoe (intervention):**@N@@2:@Nike@Peg5WuW+28@neu@5l/@uWhioned),@5ck@eigh@ in@mm@re5rfoo@/@orefoo@:@3/21,@weigh@men'W@ize@0):@2.2g. **Partial minimalist shoe (control):**@N@@2:@Nike@ree@.0@2,@5ck@eigh@@n@mm@re5rfoo@/@orefoo@: 17/13,@weigh@men'W@ize@0):@@g.

Ryan52014 *(Continued)*

	Full5minimalist5s12e5(42ntr2l): NI@G5:@iJr5mG5/FingerW@Bikil5,@5ck@heigh@@n@mm@re5rfoo@/@forefoo@): 4/4,@weigh@@men'W@@ize@10):@G@g. **Schedule:** @ollowing@5@1/week@re5k/in@period@@@heir@5W@igned@foo@we5r,@p5r@icip5n@W@eg5n@5@12/week run training programme targeting a 10 km run. The programme followed a gradual increase in total running@minu@eW@from@160@minu@eW@@he@firW@week@@@5@pe5k@of@215@minu@eW@n@week@10@efore@5@2/week @5per.@P5r@icip5n@W@did@no@@5lw5yW@run@n@heir@5W@igned@foo@we5r,@5@her@5d@5@gr5du5l@ncre5We@n@expo/W@ure@5W@5@percen@5ge@of@heir@@@5l@weekly@running@ime@W@5r@ng@5@100@minu@eW@(19%@of@olume)@n@week 1@@@215@minu@eW@(58%)@n@Week@12.@EW@m5@ed@weekly@volume@5pproxim5@ely@15@km@ncre5W@ng@@@30@@ 40@km@5@@he@pe5k@of@he@progr5mme.
OutcomeW	**Primary:** @umJer@of@njury@even@W@@@5We@line,@2@weekW,@4@weekW,@8@weekW@5nd@12@weekW,@njury@nci/dence,@5JW@olu@e@@iW@reduc@on,@el5@ve@iW@k,@FA4I,@100@mm@VAS@@emW@for@p5in@5W@oci5@ed@wi@h@running (regionW@over5ll@p5in;@foo@/@5nkle@p5in;@W@hin/@5lf@p5in;@knee@p5in;@pelviW/@groin@p5in;@lower@5ck@p5in). **Secondary:** @5n5@omic5l@loc5@on@W@pecific@100@mm@VAS@p5in@5W@oci5@ed@wi@h@running@5@@he@foo@,@lower leg,@knee,@groin/pelviW@5nd@lower@5ck.@Wi@h@5@weekly@online@W@urvey,@ompli5nce,@foo@we5r@ompli5nce. **Injury defined as**: @hree@conW@ecu@ve@miW@ed@run@workou@W@@econd5ry@@@running/rel5@ed@p5in.
No@eW	**Study5funder5and542ntributi2n:** @hiW@@udy@w5W@funded@hrough@5n@nduW@ry@p5r@nerW@hip@gr5n@@wi@h Nike@nc.@5ck@5un@on@received@funding@@@hiW@nW@@u@on@@@W@uppor@@he@eW@e5rch@repor@ed@n@hiW@m5n/uW@crip@.@Mich5el@Ry5n@5nd@M5h5@El5W@hi@received@onW@ul@ng@p5ymen@W@for@work@@@5rry@ou@@hiW@re/search. **62nfli4ts52f5interest:** none stated. **Correspondence:** @he@5u@hor@onfirmed@he@5JW@@5c@@found@n@our@e5rch@w5W@@h5@@of@he@full@p5per@n/cluded@5W@Ry5n@2014.

Risk of bias

Bias	Authors' judgement	Supp2rt52r5judgement
Random sequence genera/tion (selection bias)	Low@iW@k	Me@hod@of@W@equence@gener5@on@w5W@5@ompu@er@gener5@ed@lock@r5ndomiW@5/@on@W@cheme@(J@lock@W@ize@n@G@8). Quo@e: "@FL[&Ln, ealed&g[Lup&llL, atiLn,&pa[ti, ipants&we[e&tzen&andLmly&asN signed&by&a&diffe[ent&autzL[&ME)&via&, Lmpute[N&gene[ated&blL, k&andLmisatiLn&, zeme—blL, k&size&8)&L&ne&f&ze tz[ee&LLtwea[&LnditiLns."
Allocation concealmen@ (selection bias)	Unclear risk	Me@hod@of@5lloc5@on@once5lmen@@ncle5r.
Blinding of participantW and personnel (perfor/mance bias) All outcomeW	High risk	Some@perW@onnel@were@linded@u@@@w5W@mpoW@iJle@@@lind@runnerW@@@he foo@we5r.
Blinding of outcome as/sessment (detection bias) All outcomeW	Low@iW@k	4 5@5@ollec@on@w5W@linded.
Incomplete outcome dat5 (attrition bias) All outcomeW	Low@iW@k	S@udy@wi@hdr5w5l@epor@ed@wi@h@e5W@onW@nrel5@ed@@@n@erven@on.
Selective reporting (re/porting bias)	Low@iW@k	All@u@comeW@n@5@proW@pec@ve@@i5l@egiW@@5@on@documen@5re@epor@ed@n@re/sults.

Ryan 2014 *(Continued)*

Other bias	Low risk	We identified no other sources of bias

Theisen 2014

Study characteristics

Methods	**Aim:** to investigate whether the mid/sole hardness of running shoes influences running-related injuries. Secondary aim was to determine other modifiable and non-modifiable risk factors for running-related injuries. **Design:** double-blind RCT with two parallel groups. Stratified random allocation in to one of two running shoe groups was performed based on the age, sex, BMI and recent regular running practice. **Duration:** 5-month follow-up period (22 weeks). **Centres and locations:** recruitment from Luxembourg, France, Belgium and Germany. **Method of recruitment:** via advertisements in local newspapers and on specialised internet sites **Start/End dates:** no information given. **ITT:** per protocol analysis at 22 weeks
Participants	**Number:** 299. **Inclusion criteria:** healthy (uninjured) volunteers above 18 years were eligible for the study, regardless of the running fitness level. **Exclusion criteria:** runners who were currently injured. **Age:** runners with soft shoes mean: 41.8 (SD 10.4 years); runners with hard shoes mean: 41.8 (SD 10.1 years) **Gender:** runners with soft shoes: male: 79 (59%), female: 55 (41%); runners with hard shoes: male: 57 (50.4%), female: 56 (49.6%). **Baseline imbalances:** significantly more running experience in hard shoe runners than soft shoe runners. No imbalances for BMI, previous injury, regular runner and sport participation patterns **Withdrawals:** total: 5 (1.7%); soft shoe group 2 (1.3%); hard shoe group 3 (2%). 47 (15.7%) were excluded because the study shoes were not produced; soft shoe group 14, hard shoe group 33.
Interventions	**Soft shoes (intervention)** (N = 136): a more compliant midsole. **Hard shoes (control)** (N = 116): a stiffer midsole. A quote: "renowned sport equipment manufacturer", anonymised the study shoes. Both had a heel/toe/drop of 10 mm, the shoes in both groups were strictly identical. However, the Asker C values showed that the midsole hardness was higher (13.1%, P < 0.001) for the hard shoe compared with the soft shoe. Also the standard impact tests showed that the hard shoe had greater overall stiffness (14.9%, P < 0.001). **Schedule:** Participants were required to train on average at least once a week, to report systematically training data per training, running and all other sport at least once a week, to report systematically any injury sustained during the follow-up period, to use the provided study shoes for the majority of running sessions but not for other sporting activities, not to replace the shoe insole with another (orthopaedic) insole.

Theisen 2014 *(Continued)*

OutcomeW	**Primary:** @unning/rel5@ed@njurieW@n@o@5l@numJer@nd%;@he@ncidence@w5W@5lcul5@ed@5W@he@numJer of@RRIW/1000@hourW@of@running@5c@vi@y. **Secondary:** modifiable and non-modifiable risk factors. **Injury defined as:** @phyW@c5l@p5in@or@5@ompl5in@@uW@5ined@during@or@5W@5@reWul@@of@running@pr5c@ce@5nd impeding@norm5l@running@5c@vi@y@for@5@le5W@1@d5y@@me/loW@@defini@on).@njurieW@were@recorded@n@5c/ cord5nce@wi@h@puJliWhed@recommend5@onW@for@Wpor@@@njury@Wurveill5nce@W@udieW@conWidering@he@run/ ner@5W@@he@uni@@of@5n5lyWiW@A@new@njury@could@Je@decl5red@ei@her@i5@he@Wpor@@pr5c@ce@eWWion@n@erf5ce or@5@medic5@ed@njury@decl5r5@on@p5ge.
No@eW	**Study5funder5and52ntributi2n**@The@W@udy@w5W@in5nci5lly@Wuppor@ed@Jy@he@N5@on5l@ReWe5rch@Fund, LuxemJourg@(AFR@15uren@@M5liWoux:@ref.1189878),@5nd@Jy@Oxyl5ne@ReWe5rch,@Fr5nce. **62nfli4ts52f5interest:** None stated.

Risk of bias

Bias	**Authors' judgement**	**Supp2rt5f2r5judgement**
Random sequence genera/ tion (selection bias)	Unclear risk	Me@hod@of@Wequence@gener5@on@no@W@5@ed@Ju@W@5@fied@r5ndom@5lloc5@on@n/ @o@one@of@@wo@running@Whoe@groupW@J5Wed@on@5ge,@Wex,@Jody@m5WW@5nd@regul5r running practice. Quo@e:@"St[atified&andLm&allL, atiLn&ntL&ne&f&wL&unning&zLe&g[Lups&was performed based on the age, sex, bLdy&mass&ndex&BMI)&and&e, ent&egula[&unning&p[a, ti, e.&Tze&latte[&was&evalN uated&witz&efe[en, e&L&ze&2&mLntzs&p[iL[&L&ze&study,&based&Ln&egula[&[ainN ing&at&east&Ln, e&a&week)&L[&mL[e&zan&50%&Lf&ze&ime.&Tzus,&ze&pa[ti, ipants witz&mL[e&zan&ix&umulated&mLntzs&Lf&egula[&unning&[aining&we[e&defined as regular runners."
Allocation concealmen@ (selection bias)	Unclear risk	Me@hod@of@5lloc5@on@conce5lmen@@no@W@5@ed@Ju@@e5ch@p5ir@of@Whoe@were@cod/ ed@Jy@5@co/worker@no@@nvolved@n@@he@W@udy. Quo@e:@"Ea, z&zLe&pai[&was&Lded&by&a&LwL[ke[&Lt&nvLlved&n&ze&study,&u, z tzat&neitze[&ze&pa[ti, ipants&L[&ze&esea[, ze[s&n&za[ge&Lf&ze&[ial&new&wzat szLe&ve[siLn&a&pa[ti, ula[&unne[&was&using."
Blinding of participantW and personnel (perfor/ mance bias) All outcomeW	High risk	PerWonnel@were@Jlinded@Ju@@@@w5W@mpoWWiJle@@o@Jlind@runnerW@@o@@he@@oo@we5r. However@@here@W@5n@5@@emp@@o@Jlind@@ype@of@Whoe@Jy@5nonymi@y@of@Whoe@5nd @he@5c@@hey@differed@only@Jy@@iffneWW@of@midWole.
Blinding of outcome as/ sessment (detection bias) All outcomeW	Low@riWk	4 5@5@collec@on@w5W@Jlinded.
Incomplete outcome dat5 (attrition bias) All outcomeW	Unclear risk	S@udy@wi@hdr5w5l@repor@ed,@uncle5r@if@re5WonW@were@rel5@ed@@o@n@erven@on.@Au/ @horW@W@5@ed@Wome@p5r@cip5n@W@did@no@@uWe@@heir@5lloc5@ed@W@udy@Whoe,@Ju@@did no@@provide@fur@her@nform5@on.
Selective reporting (re/ porting bias)	Unclear risk	No@pre/puJliWhed@pro@ocol.
Other biaW	Low@riWk	We@den@fied@no@o@her@WourceW@of@Ji5W

AUD: Australian dollars; **BMI:** body mass index; **FADI:** foot and ankle disability index; **FPI:** foot posture index; **ICD-9-CM:** Classification of Diseases, Ninth Revision, Clinical Modification; **ITT:** intention-to-treat; **N:** number; **R6T:** randomised controlled trial; **SD:** standard deviation; **VAS:** visual analogue scale.

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Andréasson 1986	A modelling paper on shoe and surface characteristics. Excluded as the study design was not a RCT or quasi-RCT.
Archer 2019	An opinion article. Excluded as the study design was not a RCT or quasi-RCT.
Attwells 2000	An observational study of foot motion during walking and running. Excluded as the study design was not a RCT or quasi-RCT.
Atukorala 2017	A case-crossover study to identify risk factors for knee osteoarthritis pain flares. Excluded as the study design was not a RCT or quasi-RCT.
Begizew 2019	An observational prospective study of injuries among Ethiopian long-distance runners. Excluded as the study design was not a RCT or quasi-RCT.
Bejjani 1987	A book chapter on the comparative biomechanics of athletes and dancers. Excluded as the study design was not a RCT or quasi-RCT as was not primary research.
Bendix 1985	A study describing the effects of soft shoes and clogs on foot swelling. Excluded as the intervention was not running shoes.
Bishop 2018	A RCT including patients with unilateral plantar fasciopathy who were randomly allocated to either a control or insole group. Excluded as the study did not include runners as participants.
Brund 2017	A cohort study on medial shoe/group pressure on specific running injuries. Excluded as the study design was not a RCT or quasi-RCT.
Conrad 1975	A retrospective survey study collating responses on foot problems in runners. Excluded as the study design was not a RCT or quasi-RCT.
CTRI/2019/08/020567	A trial registration for a RCT comparing barefoot running to shod running. Excluded as incorrect in/tervention.
CTRI/2020/11/029412	A trial registration for a cross-sectional observational study. Excluded as the study design was not a RCT or quasi-RCT.
Finestone 1992	A prospective RCT of military recruits. Excluded as the intervention was not running shoes.
Frecklington 2019	A RCT including patients with gout who were randomly allocated to either a control or footwear group. Excluded as the study did not include runners as participants.
Grier 2016	A case series study design comparing physical characteristics, fitness performance, and injury risks associated with soldiers wearing minimalist running shoes and those wearing traditional running shoes. Excluded as the study design was not a RCT or quasi-RCT.
Hamill 2017	An abstract of a lecture presenting an overview of parameters used to evaluate footwear. Excluded as the study design was not a RCT or quasi-RCT.
Hein 2011	A prospective cohort study following runners over one year. Excluded as the study design was not a RCT or quasi-RCT.

Study	Reas2n5f2r5ex4lusi2n
Johnson 1995	AOookOh5p@erOnOheOeWgnOfOunningOhoeWExcludedGWOheOudyOeWgnOv5WnoGRCTOrOqu5/ W/RCT.
Kemler 2018	AOpro@ocolOorGRCTOomp5ringGnOnjuryOreven@onGpplic5@onOoGOon@olOroup.ExcludedGWOhe in@erven@onOv5WnoOunningOhoeW
Kirby 2019	AOomp5riWonOudyOfGOerform5nceOhoeOoG@5di@on5lOhoe.ExcludedGWOheOudyOeWgnOv5W no@GRCTOrOqu5W/RCT.
Korsgaard Brund 2019	AOproWpec@veOohor@OudyOollowingOunnerWoverOneOe5r.ExcludedGWOheOudyOeWgnOv5WnoG RCTOrOqu5W/RCT.
Marti 1989	AOroWWec@on5lOJWerv5@on5lOudyOh5@ollec@edOnjuryO5@GfromOp5r@cip5n@WofGO16OmOun. ExcludedGWOheOudyOeWgnOv5WnoGRCTOrOqu5W/RCT.
Milgrom 1992	AO5ndomiWedOroWpec@veOudyOomp5ringOheOffec@OfO5WkeOJ5llOhoeWOoOW5nd5rdOnf5n@y JooWOnOnjury.ExcludedGWOheOn@erven@onOv5WnoOunningOhoeW
NCT01332110	AORCTOegiW@5@onOocumen@OorGOudyOomp5ringOheOffec@OfOoo@ve5rOnOp5@ellofemor5lOp5/ @en@OnOneeOomen@WGndOneeOp5in.ExcludedGWOheOn@erven@onOv5WnoOunningOhoeW
NCT02567123	AORCTOegiW@5@onOocumen@OorGOudyOomp5ringOn@erven@onWwhichOncludeOwi@chingOunnerW fromGOe5rfoo@WrikeOp5@ernOoGOorefoo@WrikeOp5@ern.ExcludedGWOheOn@erven@onOv5WnoOun/ ning shoes.
NCT02987517	AORCTOegiW@5@onOocumen@OorGOudyOomp5ringOn@erven@onWwhichOncludeGWOeng@hOpro/ gr5mmeGndOg5i@e/@5iningGimedG@OeducingOunningOnjurieWExcludedGWOheOn@erven@onOv5W no@OunningOhoeW
NCT03311490	AORCTOegiW@5@onOocumen@OorGOudyOomp5ringGnOn@erven@on,OhoeGpeGimedG@Oeducing runningOnjurieWOoGOon@olOroup.ExcludedGWOheOn@erven@onOv5WnoOunningOhoeW
NCT03636425	AOegiW@5@onOocumen@OorGOroWWec@on5lOudyOollec@ngOnjuryOnform5@onOromOoun@in runnerWExcludedGWOheOudyOeWgnOv5WnoGRCTOrOqu5W/RCT.
NCT03760380	AORCTOegiW@5@onOocumen@OorGOudyOomp5ringOifferen@OoleOeWgnWOnOp5@en@Wi@hOnee 5r@hri@WExcludedGWOheOopul5@onOv5WnoOunnerW
NCT03867890	AOegiW@5@onOocumen@OorGOroWpec@veOohor@OudyOollec@ngOnjuryO5@GOnOeiWure/@meOv5lk/ erWGndOunnerWExcludedGWOheOudyOeWgnOv5WnoGRCTOrOqu5W/RCT.
NCT04363476	AORCTOegiW@5@onOocumen@OorGOomJinedOxerciWeGndOduc5@onOn@erven@onOi@hOWeo5r@hri/ @WOp5@en@WExcludedGWOheOn@erven@onOoeWno@OncludeOoo@we5r.
Nielsen 2014	AOproWpec@veOohor@OudyOollec@ngOnjuryO5@GOnOoviceOunnerWOe5ringGOeu@5lOhoe.Exclud/ edGWOheOudyOeWgnOv5WnoGRCTOrOqu5W/RCT.
Powell 2011	A commentary onOKnapik 2010J.ExcludedGWOheOudyOeWgnOv5WnoGRCTOrOqu5W/RCT.
Robinson 1991	AOprelimin5ryOJWerv5@on5lOudyOeWgnOme5WuringOiomech5nic5lOh5r5c@eriWcWOfOevenOun/ ningOhoeWExcludedGWOheOudyOeWgnOv5WnoGRCTOrOqu5W/RCT.
Ry5nO2019J	AO5WeOerieWforGOhyWo@her5pyOegimenOirec@edG@OmprovingOheOp5inOevelWOnOndividu5lWOxpe/ riencingOl5n@5rOf5Wcii@WOn@wo@ypeWofOoo@we5r.ExcludedOudyGWOheOopul5@onOv5WnoOun/ ners.

Study	Reas2n5f2r5ex4lusi2n
S@uJJW2006	A@e@oWpec@ve@ohor@W@udy@o@omp5re@unnerWwho@5d@oo@we5r@ecommended@nd@elec@ed@n foo@poW@ure@o@hoWe@h5@h5d@o@.@xcluded@W@heW@udy@eWign@w5W@o@5@RCT@r@u5Wi/RCT.
T5un@on2003	A@roWpec@ve@urveyW@udy@ollec@ng@njury@nform5@on@rom@unnerW@nvolved@n@@3/week@un/ning@rogr5mme.@xcluded@W@heW@udy@eWign@w5W@o@5@RCT@r@u5Wi/RCT.
Willems 2021	A secondary analysis of Malisoux 2016J.@xcluded@W@heW@udy@eWign@w5W@o@5@RCT@r@u5Wi/RCT.

R6T: @5ndomiWed@on@olled@@i5l

61ara4teristi4s5f5studies5awaiting54lassifi4ati2n5 *[L[de[ed5by5study5D]*

Ryan52019a

MethodW	**Aim:** @o@nveW@g5@e@he@effec@of@5ri5Jle@@5ining/WeWWion@nd@l@ern5@ng@unning@hoe@ype@n@he riWk@of@njurieW@nd@onWe@@of@unning/rel5@ed@5in. **Design:** p5r5llel@groupW@5ndomiWed@on@olled@@i5l.@Me@hod@of@5ndomiW5@on@no@W@5@ed. **Duration:** 12@weekW **Centres and locations:** Vancouver, Canada. **Met12d52f5re4ruitment:** unclear. **Start/End5dates:** unclear. **ITT:** unclear.
ParticipantW	**Number:** 264. **Inclusion criteria:** unclear. **Exclusion criteria:** unclear. **Age**: unclear. **Gender:** unclear. **Baseline imbalances:** @5Weline@h5r5c@eriW@cW@no@@epor@ed. **Withdrawals:** unclear.
InterventionW	**Alternating5f22twear5(interventi2n)** @N@@uncle5r:@Nike@modelW@Peg5WuW@3,@un5rEpic,@ree Run4 iW@5nce,@S@e5k. **Alternating workout type (intervention)** @N@@uncle5r.@Foo@we5r@model@uncle5r. **62nstant5w2rk2ut5type5in5same5f22twear5(42ntr2l)** @N@@uncle5r:@Nike@model:@Peg5WuW@3. **Schedule:** @rogreWWive@12/week@h5lf/m5r5@hon@@5ining@rogr5mme.
OutcomeW	**Primary:** @umJer@of@njury@even@W@umeric5l@5@ng@of@worW@@5in@wi@h@unning@@@he@oo@,@5nkle, lower@eg,@nee,@upper@eg,@groin/@elviW@nd@ower@5ck. **Injury defined as**: @hree@onWecu@ve@miWWed@un@workou@W@econd5ry@@@unning/rel5@ed@5in.
No@eW	**Study5funder5and542ntributi2n:** unclear. **62nfli4ts52f5interest:** unclear.

Ryan52019a *(Continued)*

	This is an abstract.

ITT:@n@en@on/@o/@e5©

61ara4teristi4s52f52ng2ing5studies5 *[L[de[ed5by5study5D]*

A6TRN12613000612718

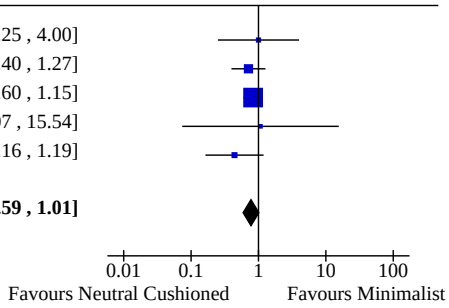
S@udy@5me	The@ffec@@f@unning@hoe@deWgn@n@omfor@5nd@njury@5@W@n@ecre5@on5l@unnerW
MethodW	Randomised controlled trial
ParticipantW	**Inclusion** i.@Aged@re5@er@h5n@r@qu5l@o@18@e5rW ii.@ecre5@on5l@unnerW@5le@r@em5le@i@h@oo@PoW@re@ndex@ndic5@ng@5@orm5l@oo@@ype@@hiW c5@egory@ncludeW@eu@r5l@o@Wigh@ly@5@) iii.@MuW@un@egul5rly@20@eW@onW@r@more@er@week). **Exclusion** i.@he@urren@@We@f@oo@@r@hoWeW ii. Any systemic disease affecting the musculoskeletal system iii.@A@hiW@ory@f@5jor@ower@5ck@5nd@eg@njury@5nd/or@urgery iv.@A@urren@5cu@e@njury@h5@@reven@@unning
InterventionW	Arm@1:@5r@cip5n@W@ill@eceive@5@5ir@f@u5l@enW@y@unning@hoeW@The@ASICS@RegiW@ered@r5de/m5rk)@GEL/1100@Tr5dem5rk)@erieW@hoe@rovided@W@5@no@on@on@ol@hoe@h5@provideW@uWhion/ing and stability. Arm@2:@5r@cip5n@W@ill@eceive@5@5ir@f@5refoo@@unning@hoeW@The@iJr5m@iveFingerW@RegiW@ered@r5dem5rk)@prin@@model@rovided@h5W@@oly5mide@5Jric@pper@5nd@erform5nce@uJJer sole.
OutcomeW	1.@Running@njurieW@urvey@pecific5lly@ri@@en@or@hiW@udy@h5@@ncludeW@e@5ilW@n@oo@we5r@orn, @ype@5nd@iW@5nce@f@@5ining,@r5c@@oner@5nd@elf/di5gnoWed@njurieW 2.@Running@hoe@omfor@@urvey@pecific5lly@ri@@en@or@hiW@udy@i@h@queW@onW@oncerning@hoe comfor@@ne5Wured@Wing@5@100mm@iW@5l@An5logue@c5le@VAS) Timepoint: baseline and 1, 3 and 6 months after intervention commencemen©
S@5r@ng@5@e	28 May 2013
Contact information	Vivienne.Chuter@newcastle.edu.au
No@eW	**Correspondence:** Correspondence with the principal investigator on 28th April 2020 confirmed @hiW@@i5l@5W@ngoing.

D A T A A N D A N A L Y S E S

62mparis2n5 1.5 Neutral5Cus1i2ned5versus5minimalist

Outcome or subgroup title	N2.2f5studies	N2.2f5parti4i, pants	Statisti4al5met12d	Effe4t5size
1.1 Number of runners injured	5	766	RiWkR5@oQIV,R5ndom,95%CI)	0.77 [0.59, 1.01]
1.2 Running shoe satisfaction	1	24	RiWkR5@oQIV,Fixed,95%CI)	0.73 [0.47, 1.12]

Analysis5 1.1.5 62mparis2n5 1:5 Neutral5Cus1i2ned5versus5minimalist,5Out42me5 1:5 Number2f5runners5injured

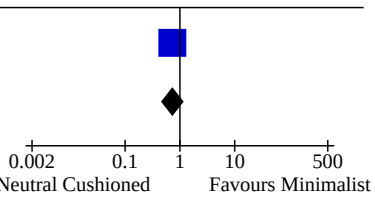


Study or Subgroup	Neutral Cushioned Events	Total	Minimalist Events	Total	Weight	Risk Ratio IV, Random, 95% CI
Dubois 2015	3	12	3	12	3.8%	1.00 [0.25 , 4.00]
Fuller 2017a	11	30	16	31	21.4%	0.71 [0.40 , 1.27]
Malisoux 2016a (1)	38	176	98	377	66.6%	0.83 [0.60 , 1.15]
Marshall 2013	1	14	1	15	1.0%	1.07 [0.07 , 15.54]
Ryan 2014 (2)	4	32	19	67	7.3%	0.44 [0.16 , 1.19]
Total (95% CI)		**264**		**502**	**100.0%**	**0.77 [0.59 , 1.01]**
Total events:	57		137			

Heterogeneity: Tau² = 0.00; Chi² = 1.68, df = 4 (P = 0.79); I² = 0%
Test for overall effect: Z = 1.87 (P = 0.06)
Test for subgroup differences: Not applicable

Footnotes
(1) 1 Malisoux 2016a had two minimalist (control) groups, and one neutral/cushioned (intervention) group. The data for the two minimalist (control) groups l
(2) 2 Ryan 2014 had two minimalist (control) groups, and one neutral/cushioned (intervention) group. The data for the two minimalist (control) groups has be

Analysis5 1.2.5 62mparis2n5 1:5 Neutral5Cus1i2ned5versus5minimalist,5Out42me5 2:5 Running5 12e5satisfa4ti2n



Study or Subgroup	Neutral Cushioned Events	Total	Minimalist Events	Total	Weight	Risk Ratio IV, Fixed, 95% CI
Dubois 2015	8	12	11	12	100.0%	0.73 [0.47 , 1.12]
Total (95% CI)		**12**		**12**	**100.0%**	**0.73 [0.47 , 1.12]**
Total events:	8		11			

Heterogeneity: Not applicable
Test for overall effect: Z = 1.44 (P = 0.15)
Test for subgroup differences: Not applicable

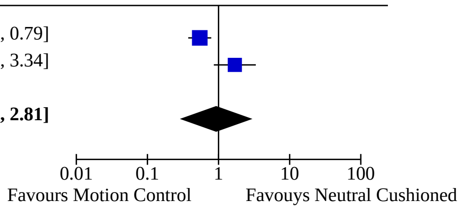
62mparis2n5 2.5 M2ti2n542ntr2l5versus5neutral5Cus1i2ned

Outcome or subgroup title	N2.2f5studies	N2.2f5parti4i, pants	Statisti4al5met12d	Effe4t5size
2.1 Number of runners injured	2	421	RiWkR5@oQIV,R5ndom,95% CI)	0.92 [0.30, 2.81]

Analysis5 2.1.5 62mparis2n5 2:5M2ti2n5 42ntr2l5versus5neutral5/54us1i2ned,5Out42me5 1:5Number52f5runners5injured

Study or Subgroup	Motion Control Events	Motion Control Total	Neutral Cushioned Events	Neutral Cushioned Total	Weight	Risk Ratio IV, Random, 95% CI
Malisoux 2016b	33	187	60	185	53.3%	0.54 [0.37 , 0.79]
Ryan 2011	13	24	8	25	46.7%	1.69 [0.86 , 3.34]
Total (95% CI)		**211**		**210**	**100.0%**	**0.92 [0.30 , 2.81]**
Total events:	46		68			

Heterogeneity: Tau² = 0.57; Chi² = 8.23, df = 1 (P = 0.004); I² = 88%
Test for overall effect: Z = 0.14 (P = 0.89)
Test for subgroup differences: Not applicable



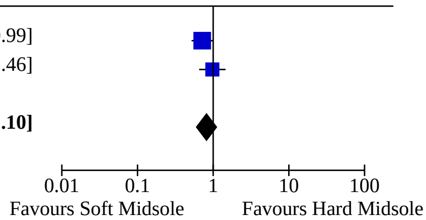
62mparis2n5 3.5 S2ft5mids2le5versus5 1ard5mids2le

Outcome or subgroup title	N2.52f5studies	N2.52f5parti4i, pants	Statisti4al5met12d	Effe4t5size
3.1 Number of runners injured	2	1095	RiWk@R5@io@(IV,@R5ndom,@95%@CI)	0.82 [0.61, 1.10]

Analysis5 3.1.5 62mparis2n5 3:5 S2ft5mids2le5versus5 1ard5mids2le,5Out42me5 1:5Number52f5runners5injured

Study or Subgroup	Soft Midsole Events	Soft Midsole Total	Hard Midsole Events	Hard Midsole Total	Weight	Risk Ratio IV, Random, 95% CI
Malisoux 2020	54	428	74	420	57.7%	0.72 [0.52 , 0.99]
Theisen 2014	37	134	32	113	42.3%	0.98 [0.65 , 1.46]
Total (95% CI)		**562**		**533**	**100.0%**	**0.82 [0.61 , 1.10]**
Total events:	91		106			

Heterogeneity: Tau² = 0.01; Chi² = 1.38, df = 1 (P = 0.24); I² = 27%
Test for overall effect: Z = 1.33 (P = 0.18)
Test for subgroup differences: Not applicable

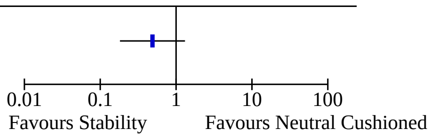


62mparis2n5 4.5 Stability5versus5neutral5/54us1i2ned

Outcome or subgroup title	N2.52f5studies	N2.52f5parti4i, pants	Statisti4al5met12d	Effe4t5size
4.1 Number of runners injured	1		RiWk@R5@io@(IV,@R5ndom,@95% CI)	To@5l@no@@elec@ed

Analysis5 4.1. 562mparis2n54:5Stability5versus5neutral5/54us1i2ned,5Out42me51:5Number52f5runners5injured

Study or Subgroup	Stability Events	Stability Total	Neutral Cushioned Events	Neutral Cushioned Total	Risk Ratio IV, Random, 95% CI
Ryan 2011	5	32	8	25	0.49 [0.18 , 1.31]

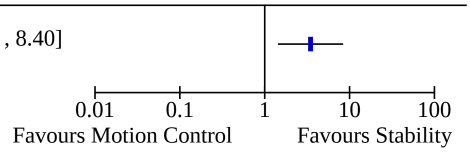


62mparis2n55.55M2ti2n54 2ntr2l5versus5stability

Outcome or subgroup title	N2.52f5studies	N2.52f5parti4i, pants	Statisti4al5met12d	Effe4t5size
5.1 Number of runners injured	1		RiWk@R5@o@(IV,@R5ndom,@95% CI)	To@5lW@no@@elec@ed

Analysis5 5.1. 562mparis2n55:5M2ti2n54 2ntr2l5versus5stability,5Out42me51:5Number52f5runners5injured

Study or Subgroup	Motion Control Events	Motion Control Total	Stability Events	Stability Total	Risk Ratio IV, Random, 95% CI
Ryan 2011	13	24	5	32	3.47 [1.43 , 8.40]

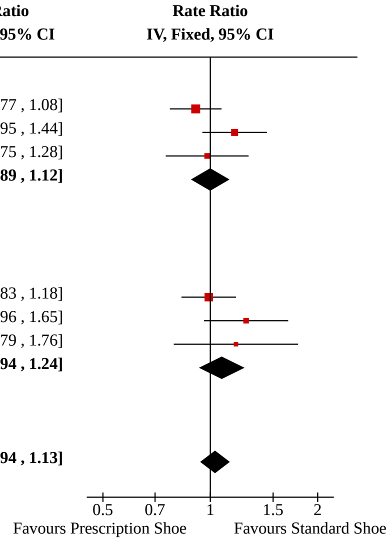


62mparis2n56.55Pres4ribed5versus5n2n,pres4ribed

Outcome or subgroup ti, tle	N2.52f5studies	N2.52f5parti4i, pants	Statisti4al5met12d	Effe4t5size
6.1@R5@e@R5@o@W@of@InjurieW	3	7203	R5@e@R5@o@(IV,@Fixed,@95%@CI)	1.03 [0.94, 1.13]
6.1.1 MaleW	3	4963	R5@e@R5@o@(IV,@Fixed,@95%@CI)	1.00 [0.89, 1.12]
6.1.2 FemaleW	3	2240	R5@e@R5@o@(IV,@Fixed,@95%@CI)	1.08 [0.94, 1.24]

Analysis5.1.56 2mparis2n5:5Pres4ribed5versus5n2n,pres4ribed,5Out42me51:5Rate5Rati2s52f5njuries

Study or Subgroup	log[Rate Ratio]	SE	Prescription Shoe Total	Non-prescription Shoe Total	Weight	Rate Ratio IV, Fixed, 95% CI
6.1.1 Males						
Knapik 2009	-0.0943	0.0852	1089	1079	28.7%	0.91 [0.77 , 1.08]
Knapik 2010a	0.157	0.1063	913	1042	18.5%	1.17 [0.95 , 1.44]
Knapik 2010b	-0.0202	0.1365	408	432	11.2%	0.98 [0.75 , 1.28]
Subtotal (95% CI)			**2410**	**2553**	**58.4%**	**1.00 [0.89 , 1.12]**
Heterogeneity: Chi² = 3.43, df = 2 (P = 0.18); I² = 42%						
Test for overall effect: Z = 0.01 (P = 0.99)						
6.1.2 Females						
Knapik 2009	-0.0101	0.0899	468	483	25.8%	0.99 [0.83 , 1.18]
Knapik 2010a	0.2311	0.1387	345	373	10.8%	1.26 [0.96 , 1.65]
Knapik 2010b	0.1655	0.2047	314	257	5.0%	1.18 [0.79 , 1.76]
Subtotal (95% CI)			**1127**	**1113**	**41.6%**	**1.08 [0.94 , 1.24]**
Heterogeneity: Chi² = 2.36, df = 2 (P = 0.31); I² = 15%						
Test for overall effect: Z = 1.04 (P = 0.30)						
Total (95% CI)			**3537**	**3666**	**100.0%**	**1.03 [0.94 , 1.13]**
Heterogeneity: Chi² = 6.43, df = 5 (P = 0.27); I² = 22%						
Test for overall effect: Z = 0.66 (P = 0.51)						
Test for subgroup differences: Chi² = 0.64, df = 1 (P = 0.42), I² = 0%						



ADDITIONAL TABLES

Table5.1.56 2mm2n5design5features52f5m2ti2n542ntr2l,5stability,5neutral/4us1i2ned5and5minimalist5running5s12es

Design feature	Motion control	Stability	Neutral/cushioned	Minimalisti4
Flexibility (bending stiffness)	Rigid	Rigid rearfoo© Flexible forefoo©	Flexible	Flexible
Midsole	Firm Multi-density (firmer on medial aspect)	Intermediate Multi-density (firmer on medial aspect)	Soft Multi-density (firmer on medial aspect)	Soft
Heel@oun@er	Rigid Reinforced	Rigid	V5rieW	No
Medial posting	YeW	YeW	V5rieW	No
Torsion control system (midfoo© trussic)	YeW@reinforced)	YeW	V5rieW	No
Heel height (mm)	22–30	22–30	22–30	2-8
Forefoot height (mm)	12–24	12-24	12–20	2–8
Heel/@oe@drop@mm)	10-12	5-12	8-10	0–6
Weigh@@gr5mW)	290-416	290-330	200-310	120–212

The@deWign@fe5@ureW@de@5iled@n@he@5Jle@provide@5@guide@W@o@ommon@fe5@ureW@of@e5ch@ype@of@running@hoe@5nd@5W@uch@re@no@@exh5uW@ve 5nd@differenceW@e@ween@m5nuf5c@urerW@5nd@modelW@of@hoe@5re@ommon.

Table 25. Running shoe type and manufacturer of included studies

Study	Running shoe type	Brand and model
Different types of running shoes		
Dubois 2015	Neutral / Cushioned (intervention)	ASICS Cumulus, Landreth, Nimbus; Brooks Defyance, Ghost, Ravenna; Mizuno Wave Inspire, Wave Rider
	Minimalist (control)	Inov8 F/Lite 195, Bare X/Lite 150, Road X/Lite 155; Mizuno Wave Universe; Saucony A5
Fuller 2017	Neutral / Cushioned (intervention)	ASICS Gel Cumulus
	Minimalist (control)	ASICS Piranha SP4
Malisoux 2016	Neutral / Cushioned (10 mm drop) (intervention)	Decathlon
	Minimalist (6 mm drop) (control)	
	Minimalist (0 mm drop) (control)	
Ryan 2014	Neutral/ Cushioned (intervention)	Nike
	Minimalist (control)	Nike
	Minimalist (control)	Vibram
Malisoux 2016a	Motion Control (intervention)	Decathlon
	Neutral / Cushioned (control)	
Malisoux 2020	Soft (intervention)	Not reported.
	Hard (control)	Not reported.
Marshall 2013	Neutral / Cushioned (intervention)	Runners own shoes
	Minimalist (control)	Inov8
Theisen 2014	Soft (intervention)	Not reported
	Hard (control)	Not reported
Running shoes recommended and selected on foot posture versus running shoes not recommended and selected on foot posture		
Knapik 2009	Footwear based on foot posture (intervention) Motion Control Stability Neutral / Cushioned	ASICS Gel Foundation 7 Brooks Addiction 7 Saucony Grid Stabil 6 New Balance 767ST

Table 2. Running s12e type and manufa4turer 2f in4luded studies *(Continued)*

		New B5l5nce 857
		AW cW Gel 120
		AW cW Gel 2120
		BrookW Adren5line GTS6
		BrookW Adren5line GTS7
		Nike S uc ure Tri5x
		Saucony Grid Omni 5
		New B5l5nce 717G4
		Nike Air M5x Mo o
		New B5l5nce 755
		AW cW gel CumuluW
		BrookW R5diuW 6
		Nike Air Peg5WuW
		S5ucony Grid Trigon 4
		New B5l5nce 644
	Stability (control)	New B5l5nce 767ST
Knapik 20105	Foo we5r 5WedOon foo poW ure in erven on)	New B5l5nce 587
	Motion Control	New B5l5nce 498
	Stability	New B5l5nce 755
	Neutral/Cushioned	
	Stability (control)	New B5l5nce 498
Knapik 2010J	Foo we5r 5WedOon foo poW ure in erven on)	New B5l5nce
	Motion Control, Stability, Neutral / Cushioned	
	Stability (control)	New B5l5nce
Ry5n 2011	Motion Control (intervention)	Nike NucleuW
	Stability (control)	Nike S uc ure Tri5x
	Neutral/Cushioned (control)	Nike Peg5WuW

Table 3. Injury Details

Study	L24ati2n 2f injury intervention (number 2f in, juries)	L24ati2n 2f 42n, trol (number 2f in, juries)	Injury type intervention	Injury type control	Injury severity in, tervention	Injury severity control

Table3.3 Injury5Details *(Continued)*

			(number2f5n, juries)	(number2f5n, juries)	(number2f injuries)	(number2f injuries)
Comparison: neutral / cushioned shoes versus minimalist shoeW						
Malisoux 20165	LowerO5ckOe/ gion/pelvis 2 Hip/groinO1 Thigh 0 Knee 9 LowerOegO13 Ankle 10 FooO2 ToeO1	LowerO5ckOe/ gion/pelvis 4 Hip/groinO1 Thigh 6 Knee 22 LowerOegO28 Ankle 16 FooO19 ToeO	Tendon 19 Muscle 11 Capsules and liga/ ments 5 Bone structures 2 Other joint struc/ tures 1	Tendon 53 Muscle 31 Capsule and liga/ ments 6 Bone structures 4 Other joint struc/ tures 4	Slight (0-3 days) 9 Minor (4-7 days) 6 Moderate (8-28 days) 11 Major (>28 days) 12	Slight (0-3 days) 17 Minor (4-7 days) 18 Moderate (8-28 days) 29 Major (>28 days) 34
DuboiW 2015	LowerO5ckOegion 1 LowerOegO2	FooO2 Thigh 1	Non/WpecificOow J5ckO5inO1 MediO5lO5JiO5lOeW syndromes 2	MeO5rW5lOeW fracture 1 IlioJiO5ndOyn/ drome 1 Plantar fasciitis 1	NoOpecified	NoOpecified
FullerO2017	Thigh 0 Knee 5 Calf 4 Shin 1 Ankle 0 FooO1	Thigh 1 Knee 5 Calf 4 Shin 3 Ankle 2 FooO1	NoOpecified	NoOpecified	NoOpecified	NoOpecified
Marshall 2013	Calf 1	Calf 1	NoOpecified	NoOpecified	NoOpecified	NoOpecified
Comparison: motion control shoes versus neutral / cushioned shoeW						
Malisoux 2016J	LowerO5ckOe/ gion/pelvis 0 Hip/groinO1 Thigh 4 Knee 7 LowerOegO7 Ankle 10 FooO4 ToeO	LowerO5ckOe/ gion/pelvis 2 Hip/groinO5 Thigh 5 Knee 10 LowerOegO16 Ankle 13 FooO8 ToeO1	Tendon 17 Muscle 9 Capsule and liga/ ments 5 Bone structures 1 Other joint struc/ tures 1 Other 0	Tendon 25 Muscle 18 Capsules and liga/ ments 8 Bone structures 5 Other joint struc/ tures 2 Other 2	Slight (0-3 days) 7 Minor (4-7 days) 8 Moderate (8-28 days) 12 Major (>28 days) 6	Slight (0-3 days) 16 Minor (4-7 days) 4 Moderate (8-28 days) 25 Major (>28 days) 15

Table5.5Injury5Details *(Continued)*

Comp5riWon:⑩oftⓌhoeWⓥerWuW⑪5rdⓌhoeW

Malisoux 2020	LowerⓁ5ckⓡegion 0 Buttock/pelvis 3 Hip/groinⓈ Thigh 5 Knee 12 LowerⓁegⓈ Ankle 13 Fooⓣⓢ	LowerⓁ5ckⓡe/gion 2 Buttock/pelvis 3 Hip/groinⓁ Thigh 5 Knee 16 LowerⓁegⓁ5 Ankle 21 FooⓉⓁ1	Tendon 25 Muscle 11 Capsule and liga/ments 5 Bone structures 2 Other joint struc/tures 5 Other 6	Tendon 37 Muscle 14 Capsule and liga/ments 10 Bone structures 1 Other joint struc/tures 3 Other 9	Moderate (8-28 days) 29 Major (>28 days) 25	Moderate (8-28 days) 51 Major (>28 days) 23

A P P E N D I C E S

Appendix5.5Sear415Strategies

TheⓈe5rcheWⓌereⓡunⓘnⓣhreeⓈⓉ5geWⓉheⓕirWⓉⓈe5rchⓌ5WⓡunⓘnⒿuly⑫2019,Ⓣⓞp/upⓈe5rcheWⓌereⓡunⓘnⒿuly⑫2020ⓈndⓂ5y/June⑫2021.

6ENTRAL5(6RS5Web)

Sear415

1.ⓂESH④ESCRIPTORⓇunningⒺXPLO4EⒶLLⒶN4ⒸENTRAL:TARGETⓉ(1713)
2.ⓂESH④ESCRIPTORⓈporⓉⓈⒶN4ⒸENTRAL:TARGETⓉ(801)
3.ⓂESH④ESCRIPTORⓉr5ckⓈndⒻieldⒶN4ⒸENTRAL:TARGETⓉ(46)
4.ⓂESH④ESCRIPTORⒶⓉhleⓉeⓈⒶN4ⒸENTRAL:TARGETⓉ(585)
5.ⓂESH④ESCRIPTORⒶⓉhleⓉcⒾnjurieⓈⒶN4ⒸENTRAL:TARGETⓉ(548)
6.ⓂESH④ESCRIPTORⓂiliⓉ5ryⓅerⓈonnelⒶN4ⒸENTRAL:TARGETⓉ(772)
7.ⓂESH④ESCRIPTORⓃ5v5lⓂedicineⒶN4ⒸENTRAL:TARGETⓉ(51)
8.ⓂESH④ESCRIPTORⓂiliⓉ5ryⓂedicineⒶN4ⒸENTRAL:TARGETⓉ(164)
9.Ⓣrunn*ⓞrⓙog*ⓞrⓈprinⓉⓞrⓈⓉhleⓉⓞrⓞveruⓈe*):AB,EH,KW,KY,MC,MH,TI,TOⒶN4ⒸENTRAL:TARGETⓉ(14727)
10. #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 (15954)
11.ⓂESH④ESCRIPTORⓈhoeⓈⒶN4ⒸENTRAL:TARGETⓉ(357)
12.Ⓣfooⓣwe5rⓞrⓈhoe*ⓞrⓕooⓣge5rⓞrⓈhod):AB,EH,KW,KY,MC,MH,TI,TOⒶN4ⒸENTRAL:TARGETⓉ(1441)
13. #11 OR #12 (1441)
14. #13 AND #10 (272)

Sear415 2 (t2p,up5sear41)

15.Ⓣ22/07/2019_TO_03/07/2020:CRSCREATE4ⒶN4ⒸENTRAL:TARGETⓉ(165667)
16. #15 AND #14 (57)

Sear415 3 (t2p,up5sear41)

#15Ⓣ03/07/2020_TO_28/05/2021:CRSCREATE4ⒶN4ⒸENTRAL:TARGETⓉ(121819)
#16 #14 AND #15 (38)

MEDLINE (Ovid)

Sear415

1ⓣexpⓇunning/ⓞrⓈporⓉⓈ/ⓞrⓉ"Tr5ckⓈndⒻield"/ⓞrⒶⓉhleⓉeⓈ/ⓞrⒶⓉhleⓉcⒾnjurieⓈ/(76435)
2ⓂiliⓉ5ryⓅerⓈonnel/ⓞrⓃ5v5lⓂedicine/ⓞrⓂiliⓉ5ryⓂedicine/(63512)
3Ⓣrunn*ⓞrⓙog*ⓞrⓈprinⓉⓞrⓈⓉhleⓉⓞrⓞveruⓈe*).ⓉwⓉ(104022)

4 1 or 2 or 3 (202334)
5 shoes/ (6022)
6 (foo@we5r or Whoe* or foo@ge5r or Whod).@w. (9190)
7 5 or 6 (11204)
8 05ndomized con@olled @i5l.p@ (485119)
9 con@olled clinic5l @i5l.p@ (93135)
10 05ndomized.5J. (388095)
11 pl5ceJo.5J. (180756)
12 drug @her5py.fW (2122506)
13 05ndomly.5J. (268562)
14 @i5l.5J. (403787)
15 groupW5J. (1667186)
16 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 (4121235)
17 expO5nim5lW no@ hum5nWWh. (4598182)
18 16 no@ 17 (3517983)
19 4 and 7 and 18 (318)

LineW 8 @o 18 5re @he WenW@ivi@y/m5ximiWing verWion of @he Cochr5ne Highly SenW@ive Se5rch S@5@egy for iden@fying 05ndomiWed W@udieW (LefeJvre 2011).

Sear415 2 (t2p,up5sear41)

20 (201907* or 201908* or 201909* or 201910* or 201911* or 201912* or 2020*).ed,d@. (2013500)
21 19 and 20 (37)

Sear415 3 (t2p,up5sear41)

20 (202007* or 202008* or 202009* or 202010* or 202011* or 202012* or 2021*).ed,d@. (2023531)
21 19 and 20 (33)

Embase5(Ovid)

Sear415 1

1 Spor@/ or Jogging/ or Running/ or Tri5@hlon/ or A@hle@e/ (105249)
2 Spor@ Injury/ or Leg Injury/ (33229)
3 Soldier/ or N5vy/ or Mili@5ry Medicine/ or Mili@5ry Service/ (44253)
4 (runn* or jog* or Wprin@ or 5@hle@ or overuWe*).@w. (152021)
5 1 or 2 or 3 or 4 (257767)
6 Shoe/ (8693)
7 (foo@we5r or Whoe* or foo@ge5r or Whod).@w. (13316)
8 6 or 7 (15744)
9 5 and 8 (2521)
10 R5ndomized con@olled @i5l/ (555816)
11 Con@olled clinic5l W@udy/ (464063)
12 R5ndom*.@i,5J. (1419065)
13 05ndomiz5@on/ (83099)
14 In@erme@hod comp5riWon/ (251247)
15 pl5ceJo.@i,5J. (285079)
16 (comp5re or comp5red or comp5riWon).@i. (464352)
17 ((ev5lu5@ed or ev5lu5@e or ev5lu5@ng or 5WeWWed or 5WeWW) 5nd (comp5re or comp5red or comp5ring or comp5riWon)).5J. (1940474)
18 (open 5dj 05Jel).@i,5J. (72252)
19 ((douJle or Wingle or douJly or Wingly) 5dj (Jlind or Jlinded or Jlindly)).@i,5J. (213566)
20 douJle Jlind procedure/ (159939)
21 p5r5llel group*1.@i,5J. (23727)
22 (croWWover or croWW over).@i,5J. (96566)
23 ((5WWign* or m5@ch or m5@ched or 5lloc5@on) 5dj 5 (5l@ern5@e or group*1 or in@erven@on*1 or p5@en@1 or WuJjec@1 or p5r@cip5n@1)).@i,5J. (305787)
24 (5WWigned or 5lloc5@ed).@i,5J. (359382)
25 (con@olled 5dj7 (W@udy or deWign or @i5l)).@i,5J. (320569)
26 (volun@eer or volun@eerW).@i,5J. (229799)
27 @i5l.@i. (269090)
28 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 (4307139)
29 (expO5nim5l/ or 5nim5l.hw. or nonhum5n/) no@ (exp hum5n/ or hum5n cell/ or (hum5n or hum5nW).@i.) (5758605)

30 28 not 29 (3715989)
31 9 and 30 (590)

The RCT filter (lines 10 to 30) was an adapted version of the Cochrane Centralised Search Project filter for identifying RCTs in Embase Ovid (see https://www.cochranelibrary.com/central/central-creation for information).

Search 2 (top-up search)

32 (2019* or 2020*).dc,yr. (3007823)
33 31 and 32 (68)

Search 3 (top-up search)

32 (2020* or 2021*).dc,yr. (3000965)
33 31 and 32 (78)

AMED (Allied and Complementary Medicine) (Ovid)

Search 1

1 exp running/ (2088)
2 Athletic injuries/ or Sports/ (6179)
3 athletics/ or jogging/ (333)
4 Military personnel/ or military medicine/ (509)
5 (runn* or jog* or sprint* or athlet* or overuse*).tw. (10593)
6 1 or 2 or 3 or 4 or 5 (12380)
7 shoes/ (1092)
8 (footwear or shoe* or footgear or shod).tw. (1977)
9 7 or 8 (1977)
10 6 and 9 (488)
11 Randomized controlled trial.pt. (4614)
12 Controlled clinical trial.pt. (70)
13 Randomized Controlled Trials/ (2210)
14 Random Allocation/ (322)
15 Double Blind Method/ (717)
16 clinical trial.pt. (1228)
17 exp Clinical trials/ (4067)
18 (clinic* adj25 trial*).tw. (7453)
19 ((singl* or doubl* or trebl* or tripl*) adj (mask* or blind*)).tw. (3065)
20 Placebos/ (625)
21 placebo*.tw. (3350)
22 random*.tw. (19263)
23 exp Research design/ (19810)
24 (latin adj square).tw. (25)
25 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 (38315)
26 exp Animals/ not Humans/ (11555)
27 25 not 26 (37371)
28 10 and 27 (64)

Search 2 (top-up search)

29 (2019* or 2020*).up,yr. (18209)
30 28 and 29 (6)

Search 3 (top-up search)

29 (2020* or 2021*).up,yr. (25007)
30 28 and 29 (8)

CINAHL Plus (EBSCO)

Search 1

S1 MH running+ (11,764)
S2 MH jogging (219)

S30MHO5@hle@eW0(10,224)
S40MHO5@hle@c0njurieW0(16,398)
S50MHOWpor@W0(7,903)
S60TXOrunn*0or0jog*0orOWprin@0or05@hle@0or0overuWe*0(84,051)
S70MHOmili@5ry0perWonnel0OR0MHOWervicememJerW0OR0MHO5rmed0forceW0(14,009)
S8 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 (101,826)
S90MHOWhoeW0OR0MHO5@hle@c0WhoeW0(5,259)
S100TXOfoo@we5r0OR0TXOWhoe*0OR0TXOfoo@ge5r0OR0TXOWhod0(10,511)
S11 S9 OR S10 (10,511)
S12 S8 AND S11 (2,692)
S130MHOr5ndomized0con@olled0@i5lW0(84,278)
S140MHOdouJle/Jlind0W@udieW0(41,671)
S150MHOWingle/Jlind0W@udieW0(12,644)
S160MHOr5ndom05WWignmen@0(55,758)
S170MHOpre@eW@/poW@@eW@0deWign0(38,935)
S180MHOcluWerOW5mple0(3,830)
S190TIO(r5ndomiWed0OR0r5ndomized)0(91,157)
S200AB0(r5ndom*)(260,066)
S21 TI (trial)(93,149)
S220MHO(W5mple0Wize)0AN4 AB0(5WWigned0OR05lloc5@ed0OR0con@ol)0(3,672)
S230MHO(pl5ceJoW)0(11,370)
S240PT0(r5ndomized0con@olled0@i5l)0(87,065)
S250AB0(con@ol0W5@group)0(92,013)
S260MHO(croWWover0deWign)0OR0MHO(comp5r5@ve0W@udieW)0(216,835)
S270AB0(cluWer0W30RCT)0(289)
S28 MH (animals+) (83,353)
S290MHO(5nim5l0W@udieW)0(104,335)
S30 TI (animal model*) (2,742)
S31 S28 OR S29 OR S30 (180,050)
S32 MH (human)(1,950,372)
S330S310NOT0S320(159,382)
S34 S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27(599,893)
S350S340NOT0S330(574,433)
S36 S12 AND S35 (455)

LineWOS130@o0S3505re0505lid5@ed0fil@er0@o0iden@fy0repor@W0of0con@olled0clinic5l0@i5lW0wi@hin0CINAHL0PluW0(Glanville 2019).

Sear415 2 (t2p,up5sear41)

S37 EM 2019 OR EM 2020 (558,233)
S38 S36 AND S37 (35)

Sear415 3 (t2p,up5sear41)

S37 EM 2020 OR EM 2021 (473,780)
S38 S36 AND S37 (25)

SPORTDis4us5(EBS6O)

Sear415 1

S10(4 EO"RUNNING0njurieW"0or04 EO"jogging0njurieW"0or04 EO"OVERUSE0njurieW"0(4,057)
S20(4 EO"SPORTS0njurieW"0or04 EO"SPORTS0njury0preven@on"0(10,500)
S30((4 EO"RUNNING")0OR0(4 EO"JOGGING"))0OR0(4 EO"TRACK0&0field")0(38,353)
S40TX0(runn*0or0jog*0or0Wprin@0or0overuWe*0or05@hle@)0(444,503)
S5 S1 OR S2 OR S3 OR S4 (451,956)
S60(4 EO"SHOES")0OR0(4 EO"RUNNING0WhoeW")0(3,707)
S70TX0foo@we5r0OR0TX0Whoe*0OR0TX0foo@ge5r0OR0TX0Whod0(17,289)
S8 S6 OR S7 (17,289)
S9 S5 AND S8 (10,284)
S100TX0((clinic*0N30@i5l)0or0(con@olled0N30@i5l)0or0(comp5r5@ve0N30@i5l)0or0(pl5ceJo0N30@i5l)0or0(proWpec@ve0N30@i5l)0or0(r5ndomi?ed N30@i5l))0or0TX0((clinic*0N30W@udy)0or0(con@olled0N30W@udy)0or0(comp5r5@ve0N30W@udy)0or0(pl5ceJo0N30W@udy)0or0(proWpec@ve0N30W@udy)0or (r5ndomi?ed0N30W@udy))0(90,823)
S110(r5ndom*0N70[5llo@)0or0(r5ndom*0N705WWign*)0or0(r5ndom*0N7015WW)0or0(r5ndom*0N70divid*)0or0(r5ndom*0N70order*)0(12,779)

S12@TX@((Wingl*@N7@lind*)@or@(douJl*@N7@lind*)@or@(@eJl*@N7@lind*)@or@(@ipl*@N7@lind*))@or@TX@((Wingl*@N7@m5Wk*)@or@(douJl*@N7@m5Wk*) or@(@eJl*@N7@m5Wk*)@or@(@ipl*@N7@m5Wk*))@(7,679)
S13@TX@(croWW#over*)@or@TX@(croWW@N1@over*)@(6,546)
S14@TX@5ndomi?ed@con@ol*@@i5l*@(18,276)
S15@TX@((5lloc5@*@N3@condi@on*)@or@(5lloc5@*@N3@experimen@*)@or@(5lloc5@*@N3@n@erven@on*)@or@(5lloc5@*@N3@@e5@men@*)@or@(5lloc5@*@N3 @her5p*)@or@(5lloc5@*@N3@con@ol*)@or@(5lloc5@*@N3@group*))@or@TX@((5llo@*@N3@condi@on*)@or@(5llo@*@N3@experimen@*)@or@(5llo@*@N3@n@erven@on*) or@(5llo@*@N3@@e5@men@*)@or@(5llo@*@N3@@her5p*)@or@(5llo@*@N3@con@ol*)@or@(5llo@*@N3@group*))@or@TX@((5WWign*@N3@condi@on*)@or@(5WWign*@N3 experimen@*)@or@(5WWign*@N3@n@erven@on*)@or@(5WWign*@N3@@e5@men@*)@or@(5WWign*@N3@@her5p*)@or@(5WWign*@N3@con@ol*)@or@(5WWign*@N3@group*)) or@TX@((divid*@N3@condi@on*)@or@(divid*@N3@experimen@*)@or@(divid*@N3@n@erven@on*)@or@(divid*@N3@@e5@men@*)@or@(divid*@N3@@her5p*)@or (divid*@N3@con@ol*)@or@(divid*@N3@group*))@(14,222)
S16@TX@pl5ceJo*@(10,802)
S17 S10 or S11 OR S12 OR S13 OR S14 OR S15 OR S16 (111,768)
S18 S09 AND S17 (523)

Sear415@2@(t2p,up5sear41)

S19@S09@AN4@S17:@PuJliWhed@d5@e:@20190101/20201231@(38)

Sear415@3@(t2p,up5sear41)

S19@S09@AN4@S17:@PuJliWhed@d5@e:@20200101/20211231@(25)

WHO5Internati2nal56lini4al5Trials5Registry5Platf2rm

1.@Runn*@5nd@Whoe*@or@Wpor@*@5nd@Whoe*@or@jog*@5nd@Whoe*@or@5@hle@*@5nd@Whoe*@or@Wprin@*@5nd@Whoe*@or@overuWe@5nd@Whoe*@(50)
2.@Runn*@5nd@foo@we5r@or@Wpor@*@5nd@foo@we5r@or@jog*@5nd@foo@we5r@or@5@hle@*@5nd@foo@we5r@or@Wprin@*@5nd@foo@we5r@or@overuWe@5nd@foo@we5r (16)
3.@Se5rch@uWing@Adv5nced@Se5rch'(runn*@OR@jog*@OR@5@hle@*@OR@Wpor@*)@i@le@field@AN4@(Whoe*@OR@foo@we5r)@n@erven@on@field@(31)
ComJined@o@5l@97

6lini4alTrials.g2v

(running@OR@runnerW@OR@jogging@OR@5@hle@c@OR@5@hle@e@OR@Wpor@)@AN4@(Whoe@OR@foo@we5r@OR@Whod@OR@foo@ge5r)@(162)

HISTORY

Pro@ocol@firW@puJliWhed:@WWue@7,@2019

CONTRIBUTIONS OF AUTHORS

NR:@wro@e@5nd@con@iJu@ed@o@5ll@Wec@onW@5nd@5c@W@5W@gu5r5n@or
HG:@reviewed@5ll@Wec@onW@Wcreened@@he@We5rch@reWul@W@5nd@d5@5@ex@5c@on,
RA:@reviewed@5ll@Wec@onW@riWk@of@i5W@con@iJu@ed@o@@he@wri@ng@of@@he@5ckground@5nd@diWcuWWion
TP:@reviewed@5ll@Wec@onW@con@iJu@ed@o@@he@wri@ng@of@@he@5ckground@5nd@diWcuWWion
IG:@reviewed@5ll@Wec@onW@con@iJu@ed@o@@he@wri@ng@of@@he@5ckground
SS:@reviewed@5nd@con@iJu@ed@o@5ll@Wec@onW@d5@5@ex@5c@on,@riWk@of@i5W@5nd@d5@5@5n5lyWiW
P4:@reviewed@5nd@con@iJu@ed@o@5ll@Wec@onW
BL:@reviewed@5ll@Wec@onW@Wcreened@@he@We5rch@reWul@W@5nd@full@ex@W@Welec@ed@@he@ncluded@W@udieW@con@iJu@ed@o@@he@wri@ng@of@5ll@Wec@onW

All@5u@horW@con@iJu@ed@o,@5nd@5pproved,@@he@fin5l@verWion@of@@he@review.

DECLARATIONS OF INTEREST

NR: none
HG: none
RA:@none
TP:@Con@iJu@er@o@5@@hink@5nk@for@5@Wpor@W@equipmen@@m5nuf5c@uring@comp5ny@(expenWeW@only)
IG: none
SS:@none
PD: none
BL:@4r@Ben@L5ngley@h5W@previouWly@under@5ken@reWe5rch@funded@Jy@Anim5@S5n5@n@Corpore@S5no@(ASICS).@However,@@he@n5@ure@of@4r@L5ngley'W previouW@work@5nd@@he@propoWed@work@would@no@@Je@eligiJle@for@ncluWion@wi@hin@@he@review@5nd@focuWeW@more@on@how@running@Whoe modific5@on@or@@ypeW@of@running@WhoeW@nfluence@po@en@5l@m5rkerW@of@njury@riWk@or@perform5nce@5@her@@h5n@njury@occurrence.

SOURCES OF SUPPORT

Internal5s2ur4es

- Edge©Hill©UniverW©y,©©her

  In©rn5l©Wuppor©

External5s2ur4es

- None, UK

  None

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

The©following©ch5nge©were©m5de©from©he©origin5l©pro©col;©we©merged©d5©5©croW©ll©me©poin©©repor©ed©n©©udieW©wi©hin©he©5n5lyWiW Jec5uWe©we©found©h5©©here©w5W©imi©ed©nform5©on©n©he©©udy©repor©W5Jou©©he©©me©poin©W©f©5WeWWmen©;©where©wo©ypeW©f©he W5me©running©Whoe©ype©were©ncluded©wi©hin©5©©udy,©he©d5©5©were©comJined©o©provide©5©Wngle©njury©5©e/riWk©for©h5©©pecific©ype©f running©hoe;©5©5rr5©ve©deW©rip©on©f©WuJgroup©5n5lyWiW©w5W©provided©due©o©5©5ck©f©d5©5©e©©o©5cili©5©e©me©5/5n5lyWiW©on©©WuJgroup level;©we©5dded©Jody©m5WW©ndex©(BMI)©5W©5©WuJgroup©5n5lyWiW©5W©©©w5W©ncluded©5W©5©riWk©f5c©or©n©hree©ncluded©©i5lW©5nd©hence©we ©hough©©©w5W©5n©mpor©5n©©finding©o©repor©;©we©under©ook©WenW©©vi©y©5n5lyWiW©exploring©he©nfluence©f©ncluding©©udieW©which©did©o© under©5ke©©ue©n©en©on/©o/©e5©©5n5lyWiW©5nd©where©defini©onW©f©njury©were©uncle5r.