

SHOD, BAREFOOT AND MINIMALIST SHOES RUNNING. A COMPARATIVE STUDY.

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Statement of Purpose

The incidence of shod running injuries on the musculoskeletal system may be explained by the design of modern shoes, which involves excessive foot pronation (Lieberman 2010, Murphy 2013) and loss in the runners feedback (Kernozek 2014). Even if numerous technological innovations have been used to improve shoe efficiency with intent to decrease the incidence of these injuries, it is yet to be investigated whether or not barefoot running could be considered more secure for running when compared with shod running. Many studies have been performed to compare shod and barefoot running, but the effects of minimalist footwear which appeared recently on the market (Altman 2012, Fong 2013, Bonacci 2014, Kerrigan 2009) remains to be fully investigated and better understood. Our purpose was to compare the plantar pressures measured during the three running conditions and to precise the effects of wearing minimalist shoes.

Design and Method

31 subjects ran at free speed barefoot (Bf), with conventional shoes (Cs) and with Five Fingers Speed minimalist shoes (Ms) on a 70 m long lane. Plantar pressures were measured for each condition during ten consecutive cycles with the WINSHOE system (Médicapteurs, Balma, France). 9 force transducers were placed on the plantar sole surface with double-sided self-adhesive tacks. Speed, cycle and stance phase durations, stride frequency, plantar pressures during strike and toe-off were analyzed and compared between running conditions at $p < 0.05$.

Results and Conclusions

In Bf and Ms running, strikes were mostly localized in middlefoot and forefoot areas (52 % and 60 %); in Cs running they were mostly localized in heel area (75 %). There was no significant difference between Bf and Ms, but there was a significant change between Cs and both Bf and Ms. Speed was not different between the running conditions. The cycle durations were similar in Bf and Ms, but were different from Cs; stance duration was longer in Cs than in Ms than in Bf. Stride frequency was similar in Bf and Ms; both were different with Cs. At strike, the plantar pressures were not different between Bf and Ms, neither in heel nor in forefoot areas, but they were different with Cs in both areas. At toe off, the intensity of pressures in the three running conditions did not show any significant difference between the running conditions. In conclusion, speed, stance phase duration and pressures at toe-off were not different when running barefoot or shod. All other investigated parameters presented systematic difference between Cs and both Bf Ms and Cs, with a similar behaviour between Bf and Ms. So, we can conclude that conventional shoes modify barefoot behaviour during running, and these results suggest that minimalist shoes, which do not modify the barefoot parameters, merely play a role of protection of foot.