

ESS3805

Biomechanical Analysis of Human Movement

View Online



1.

Sports Science - LibGuides at University of Exeter,
<http://libguides.exeter.ac.uk/SportsScienceHomePage>.

2.

Dixon, S.: The science and engineering of sport surfaces. Routledge, London (2013).

3.

Nigg, B.M., Herzog, W.: Biomechanics of the Musculo-Skeletal System. John Wiley & Sons, Chichester, West Sussex, England (2007).

4.

Bartlett, R.: Introduction to Sports Biomechanics: Analysing Human Movement Patterns. Routledge, Abingdon (2007).

5.

Bartlett, R., Bussey, M.: Sports biomechanics: reducing injury risk and improving sports performance. Routledge, London (2012).

6.

Nigg, B.M., Herzog, W.: Chapter 3. Measuring Techniques [in] Biomechanics of the Musculo-Skeletal System. In: Biomechanics of the Musculo-Skeletal System. pp. 293–333. John Wiley & Sons, Chichester, West Sussex, England (2007).

7.

Bartlett, R.: Introduction to sports biomechanics: analysing human movement patterns. Routledge, Abingdon (2007).

8.

Cavanagh, P.R., LaFortune, M.A.: Ground Reaction Forces in Distance Running [in] Journal of Biomechanics, Vol.13, No.5. Journal of Biomechanics. 13, 397–406 (1980).

9.

Miller, D.I.: Chapter 8: Ground reaction forces in distance running [in] Biomechanics of Distance Running. In: Biomechanics of Distance Running. pp. 203–224. Human Kinetics Books, Champaign, IL (1990).

10.

Bates, B.T., Osternig, L.R., Sawhill, J.A., James, S.L.: An assessment of subject variability, subject-shoe interaction, and the evaluation of running shoes using ground reaction force data [in] Journal of Biomechanics. Journal of Biomechanics. 16, 181–191 (1983).

11.

Bobbert, M F, Schamhardt, H.C., Nigg, B.M.: Calculation of vertical ground reaction force estimates during running from positional data [in] Journal of Biomechanics. Journal of. 24, 1095–1105 (1991).

12.

Bobbert M F, Yeadon, M.R., Nigg, B.M.: Mechanical analysis of the landing phase in heel-toe running (Analyse mecanique de la phase d'impact lors de la course avec appui sur le talon d'abord) [in] Journal of Biomechanics. Journal of. 25, 223–234 (1992).

13.

Hamill, Joseph, Russell, E., Gruber, A., Miller, R.: Impact characteristics in shod and barefoot running [in] Footwear Science. Footwear. 3, 33–40 (2011).

<https://doi.org/10.1080/19424280.2010.542187>.

14.

Keller, T., Weisberger, A., Ray, J., Hasan, S., Shiavi, R., Spengler, D.: Relationship between vertical ground reaction force and speed during walking, slow jogging, and running [in] Clinical Biomechanics. Clinical Biomechanics. 11, 253–259 (1996).

15.

Nordin, A.D., Dufek, J.S., Mercer, J.A.: Three-dimensional impact kinetics with foot-strike manipulations during running [in] Journal of Sport and Health Sciences. Journal of Sport and Health Science. 6, 489–497 (2017).

16.

Melvin R. Ramey: Force plate designs and applications [in] Exercise and sport sciences reviews. Exercise and sport sciences reviews. 3, 303–319 (1975).

17.

Andrew A Biewener, Full, R.J.: Force platform and kinematic analysis [in] Biomechanics: structures and systems : a practical approach. In: Biomechanics: structures and systems : a practical approach. pp. 45–73. IRL Press at Oxford University Press, Oxford (1992).

18.

Dainty, D.A., Norman, R.W.: Standardizing biomechanical testing in sport. Human Kinetics (1987).

19.

Melvin R. Ramey: Force plate designs and applications [in] Exercise and sport sciences reviews. Exercise and sport sciences reviews. 3, 303–319 (1975).

20.

Bates, B.T., Osternig, L.R., Sawhill, J.A., James, S.L.: An assessment of subject variability,

subject-shoe interaction, and the evaluation of running shoes using ground reaction force data [in] *Journal of Biomechanics*. *Journal of Biomechanics*. 16, 181–191 (1983).

21.

Bobbert, M.F., Yeadon, M.R., Nigg, B.M.: Mechanical Analysis of the Landing Phase in Heel-Toe Running [in] *Journal of Biomechanics*, Vol.25, No.3. *Journal of Biomechanics*. 25, 223–234 (1992).

22.

Lafortune, M.A., Hennig, E.M., Lake, M.J.: Dominant role of interface over knee angle for cushioning impact loading and regulating initial leg stiffness [in] *Journal of Biomechanics*, Vol.29, No.12. *Journal of Biomechanics*. 29, 1523–1529 (1996).

23.

Nigg, B.M., Herzog, W., Read, L.J.: Effect of viscoelastic shoe insoles on vertical impact forces in heel-toe running [in] *American Journal of Sports Medicine*, Vol.16, No.1. *The American Journal of Sports Medicine*. 16, 70–76 (1988).
<https://doi.org/10.1177/036354658801600113>.

24.

O'Leary, K., Anderson Vorpahl, K., Heiderscheit, B.: Effect of Cushioned Insoles on Impact Forces During Running [in] *Journal of the American Podiatric Medical Association*, Vol.98, No.1. *Journal of the American Podiatric Medical Association*. 98, 36–41.

25.

Denoth, J.: Load on the locomotor system and modelling [in] *Biomechanics of Running Shoes*. In: *Biomechanics of Running Shoes*. pp. 63–116. Human Kinetics Publishers, Champaign, IL (1985).

26.

Dixon, S.J., Collop, A.C., Singleton, T.M., Batt, M.E.: Compensatory adjustments in lower extremity kinematics in response to a reduced cushioning of the impact interface in heel-toe running [in] *Sports Engineering*, Vol.8, No.1. *Sports Engineering*. 8, (2005).

27.

Dixon, S.J., Waterworth, C., Smith, C.V., House, C.M.: Biomechanical analysis of running in military boots with new and degraded insoles [in] *Medicine and Science in Sports and Exercise*, Vol.35, No.3. *Medicine and Science in Sports and Exercise*. 35, 472–479 (2003).

28.

Hamill, J., Russell, E.M., Gruber, A.H., Miller, R.: Impact characteristics in shod and barefoot running [in] *Footwear Science*, Vol.3, No.1. *Footwear Science*. 3, 33–40 (2011).

29.

Lafortune, M.A., Lake, M.J.: Human pendulum approach to simulate and quantify locomotor impact loading [in] *Journal of Biomechanics*, Vol.28, No.9. *Journal of Biomechanics*. 28, 1111–1114 (1995).

30.

Lieberman, D.E., Venkadesan, M., Werbel, W.A., Daoud, A.I., D'Andrea, S., Davis, I.S., Mang'Eni, R.O., Pitsiladis, Y.: Foot strike patterns and collision forces in habitually barefoot versus shod runners [in] *Nature*, Vol.463, No.7280. *Nature*. 463, 531–535 (2010).

31.

Nigg, B.: Biomechanical considerations on barefoot movement and barefoot shoe concepts [in] *Footwear Science*, Vol.1, No.2. *Footwear Science*. 1, 73–79 (2009).

32.

Shorten, M., Mientjes, M.I.V.: The 'heel impact' force peak during running is neither 'heel' nor 'impact' and does not quantify shoe cushioning effects [in] *Footwear Science*, Vol.3, No.1. *Footwear Science*. 3, 41–58 (2011).

33.

Bates, B.T., Dufek, J.S., Davies, H.P.: The effect of trial size on statistical power [in]

Medicine and Science in Sports and Exercise, Vol.24, No.9. Medicine and Science in Sports and Exercise. 24, 1059–1068 (1992).

34.

Bates, B.T., Osternig, L.R., Sawhill, J.A., James, S.L.: An assessment of subject variability, subject-shoe interaction, and the evaluation of running shoes using ground reaction force data [in] Journal of Biomechanics, Vol.16, No.3. Journal of Biomechanics. 16, 181–191 (1983). [https://doi.org/10.1016/0021-9290\(83\)90125-2](https://doi.org/10.1016/0021-9290(83)90125-2).

35.

Bobbert, M.F., Yeadon, M.R., Nigg, B.M.: Mechanical Analysis of the Landing Phase in Heel-Toe Running [in] Journal of Biomechanics, Vol.25, No.3. Journal of Biomechanics. 25, 223–234 (1992).

36.

Brown, R.P.: Performance tests for artificial sports surfaces [in] Polymer Testing, Vol.7, No.4. Polymer Testing. 7, 279–292 (1987).

37.

Coyles, V.R., Lake, M.J., Patrissi, B.L.: Comparative evaluation of soccer boot traction during cutting manoeuvres: methodological considerations for field testing [in] Engineering of Sport. In: The Engineering of Sport. pp. 183–190. Blackwell Science Ltd, Cambridge (1998).

38.

Dixon, S.J., Batt, M.E., Collop, A.C.: Artificial playing surfaces research: a review of medical, engineering and biomechanical aspects [in] International Journal of Sports Medicine, Vol.20, No.4. International Journal of Sports Medicine. 20, 209–218 (1999). <https://doi.org/10.1055/s-2007-971119>.

39.

Dixon, S.J., Stiles, V.H.: Impact absorption of tennis shoe-surface combinations [in] Sports Engineering, Vol.6, No.1. Sports Engineering. 6, 1–9 (2003).

40.

Hamill, J., van Emmerik, R.E.A., Heiderscheit, B.C., Li, L.: A dynamical systems approach to lower extremity running injuries [in] Clinical Biomechanics, Vol.14, No.5. Clinical Biomechanics. 14, 297–308 (1999).

41.

Hennig, E.M., Valiant, G.A., Liu, Q.: Biomechanical variables and the perception of cushioning for running in various types of footwear [in] Journal of applied biomechanics, Vol.12. Journal of applied biomechanics. 12, 143–150 (1996).

42.

James, C.R.: Effects of injury proneness and task difficulty on joint kinetic variability [in] Medicine and science in sports and exercise, Vol.32, No.11. Medicine and science in sports and exercise. 32, 1833–1844 (2000).

43.

Lafortune, M.A.: New approach to assess in vivo rearfoot control of court footwear during sidestepping moves [in] Journal of applied biomechanics, Vol.13, No.2. Journal of applied biomechanics. 13, 197–204 (1997).

44.

Messier, S.P., Pittala, K.A.: Etiologic factors associated with selected running injuries [in] Medicine and science in sports and exercise, Vol.20, No.5. Medicine and science in sports and exercise. 20, 501–505 (1988).

45.

Miller, D.I.: Chapter 8. Ground reaction forces in distance running [in] Biomechanics of Distance Running. In: Biomechanics of Distance Running. pp. 203–223. Human Kinetics Books, Champaign, IL (1990).

46.

Nigg, B.M.: Biomechanics of Running Shoes. Human Kinetics Publishers, Champaign, IL (1985).

47.

Nigg, B.M., Yeadon, M.R.: Biomechanical aspects of playing surfaces [in] Journal of Sports Sciences, Vol.5. Journal of Sports Sciences. 5, 117–145 (1987).

48.

Nigg, B.M., Stefanyshyn, D.J., Cole, G.K.: Sport surfaces: biomechanics, injuries, performance, testing, installation. University Of Calgary, Human Performance Laboratory, Calgary (2003).

49.

Stiles, V.H., Dixon, S.J.: The biomechanical assessment of tennis surface cushioning properties during a tennis specific movement (long abstract), https://isbweb.org/images/conf/2003/html/_longAbstractsByAuthor.html.

50.

Stiles, V.H., Dixon, S.J.: The influence of different playing surfaces on the biomechanics of a tennis running forehand foot plant [in] Journal of Applied Biomechanics, Vol.22. Journal of Applied Biomechanics. 22, 14–24 (2006).

51.

Stiles, V., Dixon, S.: Biomechanical response to systematic changes in impact interface cushioning properties while performing a tennis-specific movement [in] Journal of Sports Sciences, Vol.25, No.11. Journal of Sports Sciences. 25, 1229–1239 (2007).

52.

Subotnick, S.I.: The biomechanics of running: implications for the prevention of foot injuries [in] Sports Medicine, Vol.2. Sports Medicine. 2, 144–153 (1985).

53.

Stiles, V.H.: Biomechanical Response to Changes in Natural Turf during Running and Turning [in] Journal of Applied Biomechanics, Vol.27, No.1. Journal of Applied Biomechanics. 27, 54–63 (2011).

54.

Stiles, V.H., James, I.T., Dixon, S.J., Guisasola, I.N.: Natural Turf Surfaces [in] Sports Medicine, Vol.39, No.1. Sports Medicine. 39, 65–84 (2009).

55.

Milani, T.L., Schnabel, G., Hennig, E.M.: Rearfoot motion and pressure distribution patterns during running in shoes with varus and valgus wedges [in] Journal of Applied Biomechanics, Vol.11. Journal of Applied Biomechanics. 11, 177–187 (1995).

56.

Nigg, B.M.: Pressure Distribution [in] Biomechanics of the Musculo-Skeletal System. In: Biomechanics of the Musculo-Skeletal System. pp. 334–342. John Wiley & Sons, Chichester, West Sussex, England (2007).

57.

Windle, C.M., Gregory, S.M., Dixon, S.J.: The shock attenuation characteristics of four different insoles when worn in a military boot during running and marching [in] Gait & Posture, Vol.9, No.1. Gait & Posture. 9, 31–37 (1999).

58.

Bartlett, R.: Chapter 5: 'Causes of movement - forces and torques' [in] Introduction to Sports Biomechanics. In: Introduction to Sports Biomechanics: Analysing Human Movement Patterns. pp. 213–220. Routledge, Abingdon (2007).

59.

Cavanagh, P.R., LaFortune, M.A.: Ground reaction forces in distance running [in] Journal of Biomechanics, Vol.13, No.5. Journal of Biomechanics. 13, 397–406 (1980).

60.

Dixon, S.J., Waterworth, C., Smith, C.V., House, C.M.: Biomechanical analysis of running in military boots with new and degraded insoles [in] *Medicine and Science in Sports and Exercise*, Vol.35, No.3. *Medicine and Science in Sports and Exercise*. 35, 472–479 (2003).

61.

Dixon, S.J.: Application of center-of-pressure data to indicate rearfoot inversion-eversion in shod running [in] *Journal of the American Podiatric Medical Association*, Vol.96, No.4. *Journal of the American Podiatric Medical Association*. 96, 305–312 (2006).

62.

Dixon, S.J., McNally, K.: Influence of orthotic devices prescribed using pressure data on lower extremity kinematics and pressures beneath the shoe during running [in] *Clinical Biomechanics*, Vol.23, No.5. *Clinical Biomechanics*. 23, 593–600 (2008).

63.

Fong, D.T.-P., Chan, Y.-Y., Hong, Y., Yung, P.S.-H., Fung, K.-Y., Chan, K.-M.: A three-pressure-sensor (3PS) system for monitoring ankle supination torque during sport motions [in] *Journal of Biomechanics*, Vol.41, No.11. *Journal of Biomechanics*. 41, 2562–2566 (2008).

64.

Low, D.C., Dixon, S.J.: Footscan pressure insoles: accuracy and reliability of force and pressure measurements in running [in] *Gait & Posture*, Vol.32, No.4. *Gait & Posture*. 32, 664–666 (2010).

65.

Tessutti, V., Trombini-Souza, F., Ribeiro, A.P., Nunes, A.L., Sacco, I. de C.N.: In-shoe plantar pressure distribution during running on natural grass and asphalt in recreational runners [in] *Journal of Science and Medicine in Sport*, Vol.13, No.1. *Journal of Science and Medicine in Sport*. 13, 151–155 (2010).

66.

Nigg, B.M., Herzog, W.: Biomechanics of the Musculo-Skeletal System. John Wiley & Sons, Chichester, West Sussex, England (2007).

67.

Hamill, J., Knutzen, K.M.: Chapter 12. Types of Mechanical Analysis [in] Biomechanical basis of human movement. In: Biomechanical basis of human movement. pp. 458–468. Williams & Wilkins, Malvern, Pa (1995).

68.

Winter, D.A.: Overall principle of lower limb support during stance phase of gait [in] Journal of Biomechanics, Vol.13, No.11. Journal of Biomechanics. 13, 923–927 (1980).

69.

Winter, D.A.: Moments of force and mechanical power in jogging [in] Journal of Biomechanics, Vol.16, No.1. Journal of Biomechanics. 16, 91–97 (1983).

70.

Simpson, K.J., Bates, B.T.: The effects of running speed on lower extremity joint moments generated during the support phase [in] International Journal of Sport Biomechanics, Vol.6. International Journal of Sport Biomechanics. 6, 309–324 (1990).

71.

Alexander, R.McN., Vernon, A.: The dimensions of knee and ankle muscles and the forces they exert [in] Journal of Human Movement Studies, Vol.1. Journal of Human Movement Studies. 1, 115–123 (1975).

72.

Burdett, R.G.: Forces predicted at the ankle during running [in] Medicine and Science in Sports and Exercise, Vol.14. Medicine and Science in Sports and Exercise. 14, 308–316 (1982).

73.

- Kerwin, D.G., Dixon, S.J.: The influence of heel lift manipulation on Achilles tendon loading in running [in] *Journal of Applied Biomechanics*, Vol.14. *Journal of Applied Biomechanics*. 14, 374–389 (1998).
- 74.
- Dixon, S.J., Kerwin, D.G.: Variations in Achilles tendon loading with heel lift intervention in heel-toe runners [in] *Journal of Applied Biomechanics*, Vol.18. *Journal of Applied Biomechanics*. 18, 321–331 (2002).
- 75.
- Nigg, B.M., Herzog (eds), W.: *Biomechanics of the Musculo-Skeletal System*. Wiley, Chichester (1999).
- 76.
- Komi, P.V.: Relevance of in vivo force measurements to human biomechanics [in] *Journal of Biomechanics*, Vol.23. *Journal of Biomechanics*. 23, 23–34 (1990).
- 77.
- Lichtwark, G.A., Wilson, A.M.: Interactions between the human gastrocnemius muscle and the Achilles tendon during incline, level and decline locomotion [in] *Journal of Experimental Biology*, Vol.209, No.21. *Journal of Experimental Biology*. 209, 4379–4388 (2006).
<https://doi.org/10.1242/jeb.02434>.
- 78.
- Reinschmidt, C., Nigg, B.M.: The influence of heel height on ankle joint moments in running [in] *Medicine and Science in Sports and Exercise*, Vol.27. *Medicine and Science in Sports and Exercise*. 27, 410–492 (1995).
- 79.
- Rugg, S.G., Gregor, R.J., Mandelbaum, B.R., Chiu, L.: In vivo moment arm calculations at the ankle using magnetic resonance imaging (MRI) [in] *Journal of Biomechanics*, Vol.23, No.5. *Journal of Biomechanics*. 23, 495–501 (1990).

80.

Scott, S.H., Winter, D.A.: Internal forces at chronic running injury sites [in] *Medicine and Science in Sports and Exercise*, Vol.22. *Medicine and Science in Sports and Exercise*. 22, 357–369 (1990).

81.

Alexander, R.McN.: Storage and release of elastic energy in the locomotor system and the stretchshortening cycle [in] *Biomechanics and Biology of Movement*. In: *Biomechanics and Biology of Movement*. pp. 19–29. Human Kinetics, Champaign, Ill (2000).

82.

Butler, R.J., Crowell, H.P., Davis, I.M.: Lower extremity stiffness: implications for performance and injury [in] *Clinical Biomechanics*, Vol.18, No.6. *Clinical Biomechanics*. 18, 511–517 (2003).

83.

Coyles, V.R., Lake, M.J., Lees, A.: Dynamic angular stiffness of the knee and ankle during barefoot and shod running [in] *Proceedings of the 5th Symposium on Footwear Biomechanics*. In: *Proceedings of the 5th Symposium on Footwear Biomechanics*. pp. 26–27. Dept. of Minerals, ETH Zurich, Zurich (2001).

84.

Farley, C.T., Glasheen, J., McMahon, T.A.: Running springs: speed and animal size [in] *Journal of Experimental Biology*, Vol.185. *Journal of Experimental Biology*. 185, 71–86 (1993).

85.

Farley, C.T., González, O.: Leg stiffness and stride frequency in human running [in] *Journal of Biomechanics*, Vol.29, No.2. *Journal of Biomechanics*. 29, 181–186 (1996).

86.

Farley, C.T., Houdijk, H.H.P., Van Strien, C., Louie, M.: Mechanism of leg stiffness adjustment for hopping on surfaces of different stiffnesses [in] *Journal of Applied*

Physiology, Vol.85, No.3. Journal of Applied Physiology. 85, 1044–1055 (1998).

87.

Farley, C.T., Morgenroth, D.C.: Leg stiffness primarily depends on ankle stiffness during human hopping [in] Journal of Biomechanics, Vol.32, No.3. Journal of Biomechanics. 32, 267–273 (1999).

88.

Ferris, D.P., Farley, C.T.: Interaction of leg stiffness and surface stiffness during human hopping [in] Journal of Applied Physiology, Vol.82, No.1. Journal of Applied Physiology. 82, 15–22 (1997).

89.

Ferris, D.P., Farley, C.T., Louie, M.: Running in the real world: adjusting leg stiffness for different surfaces [in] Proceedings of the Royal Society: Biological Sciences, Vol.265, No.1400. Proceedings of the Royal Society: Biological Sciences. 265, 989–994 (1998).

90.

Ferris, D.P., Liang, K., Farley, C.T.: Runners adjust leg stiffness for their first step on a new running surface [in] Journal of Biomechanics, Vol.32, No.8. Journal of Biomechanics. 32, 787–794 (1999).

91.

Kuitunen, S., Komi, P.V., Kyrolainen, H.: Knee and ankle joint stiffness in sprint running [in] Medicine and Science in Sports and Exercise, Vol.34, No.1. Medicine and Science in Sports and Exercise. 34, 166–173 (2002).

92.

Lafortune, M.A., Hennig, E.M., Lake, M.J.: Dominant role of interface over knee angle for cushioning impact loading and regulating initial leg stiffness [in] Journal of Biomechanics, Vol.29, No.12. Journal of Biomechanics. 29, 1523–1529 (1996).

93.

McMahon, T.A., Greene, P.R.: The Influence of Track Compliance on Running [in] Sport Shoes and Playing Surfaces: Biomechanical Properties. In: Sport Shoes and Playing Surfaces: Biomechanical Properties. pp. 138–162. Human Kinetics, Champaign, IL (1984).

94.

Walker, C., Blair, R.: An experimental review of the McMahon/Cheng model of running [in] Sports Engineering, Vol.4, No.3. Sports Engineering. 4, 113–121 (2001).
<https://doi.org/10.1046/j.1460-2687.2001.00075.x>.