

# ESS3805

## Biomechanical Analysis of Human Movement

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Alexander, R. McN. 2000. 'Storage and Release of Elastic Energy in the Locomotor System and the Stretchshortening Cycle [in] Biomechanics and Biology of Movement'. Pp. 19–29 in Biomechanics and Biology of Movement. Champaign, Ill: Human Kinetics.

Alexander, R. McN., and A. Vernon. 1975. '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 1:115–23.

Andrew A Biewener, and Robert J. Full. 1992. 'Force Platform and Kinematic Analysis [in] Biomechanics: Structures and Systems : A Practical Approach'. Pp. 45–73 in Biomechanics: structures and systems : a practical approach. Oxford: IRL Press at Oxford University Press.

Anon. n.d. 'Sports Science - LibGuides at University of Exeter'. Retrieved (<http://libguides.exeter.ac.uk/SportsScienceHomePage>).

Bartlett, R. 2007. 'Chapter 5: "Causes of Movement - Forces and Torgues" [in] Introduction to Sports Biomechanics'. Pp. 213–20 in Introduction to Sports Biomechanics: Analysing Human Movement Patterns. Abingdon: Routledge.

Bartlett, Roger. 2007a. Introduction to Sports Biomechanics: Analysing Human Movement Patterns. 2nd edition. Abingdon: Routledge.

Bartlett, Roger. 2007b. Introduction to Sports Biomechanics: Analysing Human Movement Patterns. 2nd edition. Abingdon: Routledge.

Bartlett, Roger, and Melanie Bussey. 2012. Sports Biomechanics: Reducing Injury Risk and Improving Sports Performance. 2nd ed. London: Routledge.

Bates, B. T., J. S. Dufek, and H. P. Davies. 1992. '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(9):1059–68.

Bates, B. T., L. R. Osternig, J. A. Sawhill, and S. L. James. 1983a. '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(3):181–91.

Bates, B. T., L. R. Osternig, J. A. Sawhill, and S. L. James. 1983b. '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(3):181–91.

Bates, B. T., L. R. Osternig, J. A. Sawhill, and S. L. James. 1983c. '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(3):181–91. doi: 10.1016/0021-9290(83)90125-2.
- Bobbert, M F, H. C. Schamhardt, and B. M. Nigg. 1991. 'Calculation of Vertical Ground Reaction Force Estimates during Running from Positional Data [in] *Journal of Biomechanics*'. *Journal Of* 24(12):1095–1105.
- Bobbert M F, M. R. Yeadon, and B. M. Nigg. 1992. '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(3):223–34.
- Bobbert, Maarten F., Maurice R. Yeadon, and Benno M. Nigg. 1992a. 'Mechanical Analysis of the Landing Phase in Heel-Toe Running [in] *Journal of Biomechanics*, Vol.25, No.3'. *Journal of Biomechanics* 25(3):223–34.
- Bobbert, Maarten F., Maurice R. Yeadon, and Benno M. Nigg. 1992b. 'Mechanical Analysis of the Landing Phase in Heel-Toe Running [in] *Journal of Biomechanics*, Vol.25, No.3'. *Journal of Biomechanics* 25(3):223–34.
- Brown, R. P. 1987. 'Performance Tests for Artificial Sports Surfaces [in] *Polymer Testing*, Vol.7, No.4'. *Polymer Testing* 7(4):279–92.
- Burdett, R. G. 1982. 'Forces Predicted at the Ankle during Running [in] *Medicine and Science in Sports and Exercise*, Vol.14'. *Medicine and Science in Sports and Exercise* 14:308–16.
- Butler, Robert J., Harrison P. Crowell, and Irene McClay Davis. 2003. 'Lower Extremity Stiffness: Implications for Performance and Injury [in] *Clinical Biomechanics*, Vol.18, No.6'. *Clinical Biomechanics* 18(6):511–17.
- Cavanagh, P. R., and M. A. Lafortune. 1980. 'Ground Reaction Forces in Distance Running [in] *Journal of Biomechanics*, Vol.13, No.5'. *Journal of Biomechanics* 13(5):397–406.
- Cavanagh, Peter R., and Mario A. Lafortune. 1980. 'Ground Reaction Forces in Distance Running [in] *Journal of Biomechanics*, Vol.13, No.5'. *Journal of Biomechanics* 13(5):397–406.
- Coyles, V. R., M. J. Lake, and A. Lees. 2001. 'Dynamic Angular Stiffness of the Knee and Ankle during Barefoot and Shod Running [in] *Proceedings of the 5th Symposium on Footwear Biomechanics*'. Pp. 26–27 in *Proceedings of the 5th Symposium on Footwear Biomechanics*. Zurich: Dept. of Minerals, ETH Zurich.
- Coyles, V. R., M. J. Lake, and B. L. Patritti. 1998. 'Comparative Evaluation of Soccer Boot Traction during Cutting Manoeuvres: Methodological Considerations for Field Testing [in] *Engineering of Sport*'. Pp. 183–90 in *The Engineering of Sport*. Cambridge: Blackwell Science Ltd.
- Dainty, D. A., and R. W. Norman. 1987. *Standardizing Biomechanical Testing in Sport*. Human Kinetics.
- Denoth, J. 1985. 'Load on the Locomotor System and Modelling [in] *Biomechanics of Running Shoes*'. Pp. 63–116 in *Biomechanics of Running Shoes*. Champaign, IL: Human

Kinetics Publishers.

Dixon, S. J. 2006. '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(4):305–12.

Dixon, S. J., M. E. Batt, and A. C. Collop. 1999. '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(4):209–18. doi: 10.1055/s-2007-971119.

Dixon, S. J., A. C. Collop, T. M. Singleton, and M. E. Batt. 2005. '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(1).

Dixon, S. J., and D. G. Kerwin. 2002. 'Variations in Achilles Tendon Loading with Heel Lift Intervention in Heel-Toe Runners [in] Journal of Applied Biomechanics, Vol.18'. Journal of Applied Biomechanics 18:321–31.

Dixon, S. J., and V. H. Stiles. 2003. 'Impact Absorption of Tennis Shoe-Surface Combinations [in] Sports Engineering, Vol.6, No.1'. Sports Engineering 6(1):1–9.

Dixon, S. J., C. Waterworth, C. V. Smith, and C. M. House. 2003a. '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(3):472–79.

Dixon, S. J., C. Waterworth, C. V. Smith, and C. M. House. 2003b. '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(3):472–79.

Dixon, Sharon. 2013. The Science and Engineering of Sport Surfaces. London: Routledge.  
Dixon, Sharon J., and Kate McNally. 2008. '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(5):593–600.

Farley, C. T., J. Glasheen, and T. A. McMahon. 1993. 'Running Springs: Speed and Animal Size [in] Journal of Experimental Biology, Vol.185'. Journal of Experimental Biology 185:71–86.

Farley, C. T., H. H. P. Houdijk, C. Van Strien, and M. Louie. 1998. '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(3):1044–55.

Farley, Claire T., and Octavio González. 1996. 'Leg Stiffness and Stride Frequency in Human Running [in] Journal of Biomechanics, Vol.29, No.2'. Journal of Biomechanics 29(2):181–86.

Farley, Claire T., and David C. Morgenroth. 1999. 'Leg Stiffness Primarily Depends on Ankle

Stiffness during Human Hopping [in] *Journal of Biomechanics*, Vol.32, No.3'. *Journal of Biomechanics* 32(3):267-73.

Ferris, D. P., and C. T. Farley. 1997. 'Interaction of Leg Stiffness and Surface Stiffness during Human Hopping [in] *Journal of Applied Physiology*, Vol.82, No.1'. *Journal of Applied Physiology* 82(1):15-22.

Ferris, D. P., C. T. Farley, and M. Louie. 1998. '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(1400):989-94.

Ferris, Daniel P., Kailine Liang, and Claire T. Farley. 1999. '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(8):787-94.

Fong, Daniel Tik-Pui, Yue-Yan Chan, Youlian Hong, Patrick Shu-Hang Yung, Kwai-Yau Fung, and Kai-Ming Chan. 2008. '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(11):2562-66.

Hamill, Joseph, Richard E. A. van Emmerik, Bryan C. Heiderscheit, and Li Li. 1999. 'A Dynamical Systems Approach to Lower Extremity Running Injuries [in] *Clinical Biomechanics*, Vol.14, No.5'. *Clinical Biomechanics* 14(5):297-308.

Hamill, Joseph, and Kathleen M. Knutzen. 1995. 'Chapter 12. Types of Mechanical Analysis [in] *Biomechanical Basis of Human Movement*'. Pp. 458-68 in *Biomechanical basis of human movement*. Malvern, Pa: Williams & Wilkins.

Hamill, Joseph, E. Russell, A. Gruber, and R. Miller. 2011. 'Impact Characteristics in Shod and Barefoot Running [in] *Footwear Science*'. *Footwear* 3(Issue 1):33-40. doi: 10.1080/19424280.2010.542187.

Hamill, Joseph, Elizabeth M. Russell, Allison H. Gruber, and Ross Miller. 2011. 'Impact Characteristics in Shod and Barefoot Running [in] *Footwear Science*, Vol.3, No.1'. *Footwear Science* 3(1):33-40.

Hennig, E. M., G. A. Valiant, and Q. Liu. 1996. '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* 12:143-50.

James, C. R. 2000. '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(11):1833-44.

Keller, TS, AM Weisberger, JL Ray, SS Hasan, RG Shiavi, and DM Spengler. 1996. 'Relationship between Vertical Ground Reaction Force and Speed during Walking, Slow Jogging, and Running [in] *Clinical Biomechanics*'. *Clinical Biomechanics* 11(5):253-59.

Kerwin, D. G., and S. J. Dixon. 1998. 'The Influence of Heel Lift Manipulation on Achilles Tendon Loading in Running [in] *Journal of Applied Biomechanics*, Vol.14'. *Journal of Applied Biomechanics* 14:374-89.

- Komi, Paavo V. 1990. 'Relevance of in Vivo Force Measurements to Human Biomechanics [in] Journal of Biomechanics, Vol.23'. Journal of Biomechanics 23:23-34.
- Kuitunen, S., P. V. Komi, and H. Kyrolainen. 2002. '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(1):166-73.
- Lafortune, M. A. 1997. '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(2):197-204.
- Lafortune, Mario A., Ewald M. Hennig, and Mark J. Lake. 1996a. '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(12):1523-29.
- Lafortune, Mario A., Ewald M. Hennig, and Mark J. Lake. 1996b. '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(12):1523-29.
- Lafortune, Mario A., and Mark J. Lake. 1995. 'Human Pendulum Approach to Simulate and Quantify Locomotor Impact Loading [in] Journal of Biomechanics, Vol.28, No.9'. Journal of Biomechanics 28(9):1111-14.
- Lichtwark, G. A., and A. M. Wilson. 2006. '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(21):4379-88. doi: 10.1242/jeb.02434.
- Lieberman, Daniel E., Madhusudhan Venkadesan, William A. Werbel, Adam I. Daoud, Susan D'Andrea, Irene S. Davis, Robert Ojiambo Mang'Eni, and Yannis Pitsiladis. 2010. 'Foot Strike Patterns and Collision Forces in Habitually Barefoot versus Shod Runners [in] Nature, Vol.463, No.7280'. Nature 463(7280):531-35.
- Low, D. C., and S. J. Dixon. 2010. 'Footscan Pressure Insoles: Accuracy and Reliability of Force and Pressure Measurements in Running [in] Gait & Posture, Vol.32, No.4'. Gait & Posture 32(4):664-66.
- McMahon, T. A., and P. R. Greene. 1984. 'The Influence of Track Compliance on Running [in] Sport Shoes and Playing Surfaces: Biomechanical Properties'. Pp. 138-62 in Sport Shoes and Playing Surfaces: Biomechanical Properties. Champaign, IL: Human Kinetics.
- Melvin R. Ramey. 1975a. 'Force Plate Designs and Applications [in] Exercise and Sport Sciences Reviews'. Exercise and Sport Sciences Reviews 3:303-19.
- Melvin R. Ramey. 1975b. 'Force Plate Designs and Applications [in] Exercise and Sport Sciences Reviews'. Exercise and Sport Sciences Reviews 3:303-19.
- Messier, S. P., and K. A. Pittala. 1988. '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(5):501-5.
- Milani, T. L., G. Schnabel, and E. M. Hennig. 1995. '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* 11:177–87.
- Miller, D. I. 1990a. 'Chapter 8: Ground Reaction Forces in Distance Running [in] *Biomechanics of Distance Running*'. Pp. 203–24 in *Biomechanics of Distance Running*. Champaign, IL: Human Kinetics Books.
- Miller, D. I. 1990b. 'Chapter 8. Ground Reaction Forces in Distance Running [in] *Biomechanics of Distance Running*'. Pp. 203–23 in *Biomechanics of Distance Running*. Champaign, IL: Human Kinetics Books.
- Nigg, B. M. 2007. 'Pressure Distribution [in] *Biomechanics of the Musculo-Skeletal System*'. Pp. 334–42 in *Biomechanics of the Musculo-Skeletal System*. Chichester, West Sussex, England: John Wiley & Sons.
- Nigg, B. M., and W. Herzog. 2007. 'Chapter 3. Measuring Techniques [in] *Biomechanics of the Musculo-Skeletal System*'. Pp. 293–333 in *Biomechanics of the Musculo-Skeletal System*. Chichester, West Sussex, England: John Wiley & Sons.
- Nigg, B. M., W. Herzog, and L. J. Read. 1988. '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(1):70–76. doi: 10.1177/036354658801600113.
- Nigg, B. M., and M. R. Yeadon. 1987. 'Biomechanical Aspects of Playing Surfaces [in] *Journal of Sports Sciences*, Vol.5'. *Journal of Sports Sciences* 5:117–45.
- Nigg, Benno. 2009. 'Biomechanical Considerations on Barefoot Movement and Barefoot Shoe Concepts [in] *Footwear Science*, Vol.1, No.2'. *Footwear Science* 1(2):73–79.
- Nigg, Benno M. 1985. *Biomechanics of Running Shoes*. Champaign, IL: Human Kinetics Publishers.
- Nigg, Benno M., and Walter Herzog (eds). 1999. *Biomechanics of the Musculo-Skeletal System*. 2nd ed. Chichester: Wiley.
- Nigg, Benno M., Darren J. Stefanyshyn, and Gerald K. Cole. 2003. *Sport Surfaces: Biomechanics, Injuries, Performance, Testing, Installation*. Calgary: University Of Calgary, Human Performance Laboratory.
- Nigg, Benno Maurus, and W. Herzog. 2007a. *Biomechanics of the Musculo-Skeletal System*. 3rd ed. Chichester, West Sussex, England: John Wiley & Sons.
- Nigg, Benno Maurus, and W. Herzog. 2007b. *Biomechanics of the Musculo-Skeletal System*. 3rd ed. Chichester, West Sussex, England: John Wiley & Sons.
- Nordin, Andrew D., Janet S. Dufek, and John A. Mercer. 2017. 'Three-Dimensional Impact Kinetics with Foot-Strike Manipulations during Running [in] *Journal of Sport and Health Sciences*'. *Journal of Sport and Health Science* 6(4):489–97.
- O'Leary, K., K. Anderson Vorpahl, and B. Heiderscheit. n.d. '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(1):36-41.

Reinschmidt, C., and B. M. Nigg. 1995. '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* 27:410-92.

Rugg, S. G., R. J. Gregor, B. R. Mandelbaum, and L. Chiu. 1990. '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(5):495-501.

Scott, S. H., and D. A. Winter. 1990. 'Internal Forces at Chronic Running Injury Sites [in] *Medicine and Science in Sports and Exercise*, Vol.22'. *Medicine and Science in Sports and Exercise* 22:357-69.

Shorten, Martyn, and Martine I. V. Mientjes. 2011. '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(1):41-58.

Simpson, K. J., and B. T. Bates. 1990. '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* 6:309-24.

Stiles, V. H. 2011. '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(1):54-63.

Stiles, V. H., and S. J. Dixon. 2003. 'The Biomechanical Assessment of Tennis Surface Cushioning Properties during a Tennis Specific Movement (Long Abstract)'. *International Society of Biomechanics XIXth Congress*. Retrieved ([https://isbweb.org/images/conf/2003/html/\\_longAbstractsByAuthor.html](https://isbweb.org/images/conf/2003/html/_longAbstractsByAuthor.html)).

Stiles, V. H., and S. J. Dixon. 2006. '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.

Stiles, Victoria, and Sharon Dixon. 2007. '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(11):1229-39.

Stiles, Victoria H., Iain T. James, Sharon J. Dixon, and Igor N. Guisasola. 2009. 'Natural Turf Surfaces [in] *Sports Medicine*, Vol.39, No.1'. *Sports Medicine* 39(1):65-84.

Subotnick, S. I. 1985. 'The Biomechanics of Running: Implications for the Prevention of Foot Injuries [in] *Sports Medicine*, Vol.2'. *Sports Medicine* 2:144-53.

Tessutti, Vitor, Francis Trombini-Souza, Ana Paula Ribeiro, Ana Luiza Nunes, and Isabel de Camargo Neves Sacco. 2010. '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(1):151-55.

Walker, C., and R. Blair. 2001. 'An Experimental Review of the McMahon/Cheng Model of

Running [in] Sports Engineering, Vol.4, No.3'. Sports Engineering 4(3):113-21. doi: 10.1046/j.1460-2687.2001.00075.x.

Windle, Carol M., Sarah M. Gregory, and Sharon J. Dixon. 1999. '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(1):31-37.

Winter, David A. 1980. 'Overall Principle of Lower Limb Support during Stance Phase of Gait [in] Journal of Biomechanics, Vol.13, No.11'. Journal of Biomechanics 13(11):923-27.  
Winter, David A. 1983. 'Moments of Force and Mechanical Power in Jogging [in] Journal of Biomechanics, Vol.16, No.1'. Journal of Biomechanics 16(1):91-97.