References

1. Farrar R, Mayhew J. Oxygen cost of kettlebell swings. J Strength & [Internet]. 2010 [cited 2012 Apr 10]; Available from: http://www.ncbi.nlm.nih.gov/pubmed?term=oxygen cost of kettlebell swings

2. Jay K, Frisch D, Hansen K, Zebis MK, Andersen CH, Mortensen OS, et al. Kettlebell training for musculoskeletal and cardiovascular health: a randomized controlled trial. Scand J Work Env Heal. Finland; 2011;37(3):196–203.

3. Schnettler C, Porcari J, Foster C, Anders M. Kettlebells: Twice the Results in Half the Time? ACE Fitness Matters [Internet]. 2010 [cited 2014 Jul 23];(January/February):6–11. Available from: http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Kettlebells:+Twice+the+Results+in+Half+the+Time? - 0

4. Jay K. Viking Warrior Conditioning [Internet]. 2010 [cited 2014 Aug 24]. Available from: http://www.amazon.com/Viking-Warrior-Conditioning-Kenneth-Jay/dp/0938045040

5. U.S. fitness industry revenue by sector 2012 | Statistic [Internet]. [cited 2014 Jul 21]. Available from: http://www.statista.com/statistics/242190/us-fitness-industry-revenue-by-sector/

6. Cardio- | Define Cardio- at Dictionary.com [Internet]. [cited 2014 Aug 27]. Available from: http://dictionary.reference.com/browse/cardio-

7. Vascular | Define Vascular at Dictionary.com [Internet]. [cited 2014 Aug 27]. Available from: http://dictionary.reference.com/browse/vascular?s=t

8. Klarbunde RE. Cardiovascular Physiology Concepts [Paperback] [Internet]. Second edi. Lippincott Williams & Wilkins; 2011 [cited 2014 Jul 2]. Available from: http://www.amazon.com/Cardiovascular-Physiology-Concepts-Richard-Klabunde/dp/1451113846

9. McArdle WD, Katch FI, Katch VL. Essentials of Exercise Physiology [Internet]. 2006 [cited 2014 Jul 2]. Available from: http://books.google.dk/books/about/Essentials_of_Exercise_Physiology.html?id=L4aZIDbmV3oC&pgis=1

10. Koeppen BM, Stanton BA. Berne & Levy Physiology, Updated Edition (Google eBook) [Internet]. Elsevier Health Sciences; 2009 [cited 2014 Jul 2]. Available from: http://books.google.com/books?id=rVSOC3q3QJ0C&pgis=1

11. Respiratory Physiology: The Essentials [Internet]. LWW; Ninth edition; 2011 [cited 2014 Jul 2]. Available from: http://www.amazon.com/Respiratory-Physiology-Essentials-RESPIRATORY-PHYSIOLOGY/dp/1609136403

12. Fisman EZ, Embon P, Pines A, Tenenbaum A, Drory Y, Shapira I, et al. Comparison of left ventricular function using isometric exercise Doppler echocardiography in competitive runners and weightlifters versus sedentary individuals. Am J Cardiol [Internet]. 1997 Feb 1 [cited 2014 Jul 27];79(3):355–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/9036758

13. Venckunas T, Lionikas A, Marcinkeviciene JE, Raugaliene R, Alekrinskis A, Stasiulis A. Echocardiographic parameters in athletes of different sports. J Sports Sci Med [Internet]. 2008 Jan [cited 2014 Jul 27];7(1):151–6. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3763341&tool=pmcentrez&rendertype=abstract

14. MacDougall JD, Tuxen D, Sale DG, Moroz JR, Sutton JR. Arterial blood pressure response to heavy resistance exercise. J Appl Physiol [Internet]. 1985 Mar [cited 2014 Jul 27];58(3):785–90. Available from: http://www.ncbi.nlm.nih.gov/pubmed/3980383

15. Morganroth J, Maron BJ, Henry WL, Epstein SE. Comparative left ventricular dimensions in trained athletes. Ann Intern Med [Internet]. 1975 Apr [cited 2014 Jul 27];82(4):521–4. Available from: http://www.ncbi.nlm.nih.gov/pubmed/1119766

16. Maron BJ. Hypertrophic Cardiomyopathy. JAMA [Internet]. American Medical Association; 2002 Mar 13 [cited 2014 Jul 16];287(10):1308–20. Available from: http://jama.jamanetwork.com/article.aspx?articleid=194713

17. Mihl C, Dassen WRM, Kuipers H. Cardiac remodelling: concentric versus eccentric hypertrophy in strength and endurance athletes. Neth Heart J [Internet]. 2008 Apr [cited 2014 Jul 27];16(4):129–33. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2300466&tool=pmcentrez&rendertype=abstract

18. Spirito P, Pelliccia A, Proschan MA, Granata M, Spataro A, Bellone P, et al. Morphology of the "athlete's heart" assessed by echocardiography in 947 elite athletes representing 27 sports. Am J Cardiol [Internet]. 1994 Oct 15 [cited 2014 Jul 30];74(8):802–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/7942554

19. Denise L. Smith, PhD, and Bo Fernhall P. Resistance exercise produces cardiovascular benefits. Advanced Cardiovascular Exercise Physiology [Internet]. 2011 [cited 2014 Jul 30]. p.

240. Available from: http://www.humankinetics.com/excerpts/excerpts/resistance-exercise-produces-cardiovascular-benefits

20. McArdle WD, Katch FI, Katch VL. Exercise Physiology: Nutrition, Energy, and Human Performance [Internet]. 2010 [cited 2014 Jul 28]. Available from: http://books.google.dk/books/about/Exercise_Physiology.html?id=XOyjZX0Wxw4C&pgis=1

21. Lester M, Sheffield LT, Trammell P, Reeves TJ. The effect of age and athletic training on the maximal heart rate during muscular exercise. Am Heart J [Internet]. 1968 Sep [cited 2014 Jul 28];76(3):370–6. Available from: http://www.sciencedirect.com/science/article/pii/0002870368902330

22. Saltin B, Astrand PO. Maximal oxygen uptake in athletes. J Appl Physiol [Internet]. 1967 Sep 1 [cited 2014 Jul 28];23(3):353–8. Available from: http://jap.physiology.org/content/23/3/353

23. Clinical Exercise Physiology: Application and Physiological Principles [Internet]. 2004 [cited 2014 Jul 2]. Available from: http://books.google.dk/books/about/Clinical_Exercise_Physiology.html?id=NuzcFMMQmzoC&pgis=1

24. Adams WC, Bernauer EM, Dill DB, Bomar JB. J. Effects of equivalent sea-level and altitude training on VO2max and running performance. J Appl Physiol [Internet]. 1975 Aug 1 [cited 2014 Aug 20];39(2):262–6. Available from: http://jap.physiology.org/content/39/2/262

25. Bassett DR, Howley ET. Limiting factors for maximum oxygen uptake and determinants of endurance performance. Med Sci Sports Exerc [Internet]. 2000 Jan;32(1):70–84. Available from: http://www.ncbi.nlm.nih.gov/pubmed/10647532

26. Secher NH. Physiological and biomechanical aspects of rowing. Implications for training. Sports Med [Internet]. 1993 Jan [cited 2014 Jul 21];15(1):24–42. Available from: http://www.ncbi.nlm.nih.gov/pubmed/8426942

27. BASSETT DR, HOWLEY ET. Maximal oxygen uptake: classical versus contemporary viewpoints. Med &amp Sci Sport &amp Exerc [Internet]. 1997 May 1 [cited 2014 Jul 29];29(5):591–603. Available from: http://europepmc.org/abstract/MED/9140894

28. De Cort SC, Innes JA, Barstow TJ, Guz A. Cardiac output, oxygen consumption and arteriovenous oxygen difference following a sudden rise in exercise level in humans. J Physiol [Internet]. 1991 Sep [cited 2014 Jul 22];441:501–12. Available from:

http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1180211&tool=pmcentrez&rendertype=abstract

29. ASTRAND I. Aerobic work capacity in men and women with special reference to age. Acta Physiol Scand Suppl [Internet]. 1960 Jan [cited 2014 Jul 31];49(169):1–92. Available from: http://www.ncbi.nlm.nih.gov/pubmed/13794892

30. Hurley BF, Seals DR, Ehsani AA, Cartier LJ, Dalsky GP, Hagberg JM, et al. Effects of high-intensity strength training on cardiovascular function. Med Sci Sports Exerc [Internet]. 1984 Oct [cited 2014 Jul 2];16(5):483–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/6513767

31. Gettman LR, Ayres JJ, Pollock ML, Jackson A. The effect of circuit weight training on strength, cardiorespiratory function, and body composition of adult men. Med Sci Sports [Internet]. 1978 Jan [cited 2014 May 28];10(3):171–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/723506

32. Monteiro AG, Alveno DA, Prado M, Monteiro GA, Ugrinowitsch C, Aoki MS, et al. Acute physiological responses to different circuit training protocols. J Sports Med Phys Fitness [Internet]. 2008 Dec [cited 2014 May 28];48(4):438–42. Available from: http://www.ncbi.nlm.nih.gov/pubmed/18997645

33. COLLINS M, CURETON K, HILL D. Relationship of heart rate to oxygen uptake during weight lifting exercise. HEART [Internet]. 1991 [cited 2014 Jul 2];(5):2–6. Available from: http://www.researchgate.net/publication/21082874_Relationship_of_heart_rate_to_oxygen_uptake_during_weight_lifting_exercise/file/504635210e7af87a2b.pdf

34. Jansen R, Schmidtbleicher D, Cabri J. [Cardiopulmonary responses during high intensity weight training in male handball players]. Sportverletz Sportschaden [Internet]. 2007 Mar [cited 2014 Jul 2];21(1):15–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/17489154

35. Lounana J, Campion F, Noakes TD, Medelli J. Relationship between %HRmax, %HR reserve, %VO2max, and %VO2 reserve in elite cyclists. Med Sci Sports Exerc [Internet]. 2007 Feb [cited 2014 May 28];39(2):350–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/17277600

36. Hempel L, Wells C. Cardiorespiratory cost of the Nautilus express circuit. Physician … [Internet]. 1985 [cited 2014 Aug 1];13:82–97. Available from: http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Cardiorespiratory+cost+of+the+nautilus+express+circuit - 0

37. Gettman L, Pollock M. Circuit weight training: a critical review of its physiological benefits. Physician Sport [Internet]. 1981 [cited 2014 Aug 1];9:44–60. Available from: http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Circuit+weight+training:+a+critical+review+of+its+physiological+benefits - 0

38. Gettman LR, Ayres JJ, Pollock ML, Durstine JL, Grantham W. Physiologic effects on adult men of circuit strength training and jogging. Arch Phys Med Rehabil [Internet]. 1979 Mar [cited 2014 May 28];60(3):115–20. Available from: http://www.ncbi.nlm.nih.gov/pubmed/485800

39. Sherwood L. Human Physiology: From Cells to Systems [Internet]. Cengage Learning; 2008 [cited 2014 Aug 20]. Available from: http://books.google.com/books?id=gOmpysGBC90C&pgis=1

40. Gropper S, Smith J. Advanced Nutrition and Human Metabolism [Internet]. 2012 [cited 2014 Aug 20]. Available from: http://www.google.dk/books?hl=da&lr=&id=ja8KAAAAQBAJ&pgis=1

41. Mougios V. Exercise Biochemistry [Internet]. Human Kinetics; 2006 [cited 2014 Aug 20]. Available from: http://books.google.com/books?id=e-j42s0qISwC&pgis=1

42. Spurr GB, Reina JC, Prentice AM. Energy expenditure from minute-by-minute recording : comparison with indirect curves. Stand. 1988;

43. Gastin PB. Energy system interaction and relative contribution during maximal exercise. Sports Med [Internet]. 2001 Jan [cited 2014 Aug 19];31(10):725–41. Available from: http://www.ncbi.nlm.nih.gov/pubmed/11547894

44. De Feo P, Di Loreto C, Lucidi P, Murdolo G, Parlanti N, De Cicco A, et al. Metabolic response to exercise. J Endocrinol Invest [Internet]. 2003 Sep [cited 2014 Aug 19];26(9):851–4. Available from: http://www.ncbi.nlm.nih.gov/pubmed/14964437

45. Top End Sports. VO2 max World Records [Internet]. [cited 2014 Jul 31]. Available from: http://www.topendsports.com/testing/records/vo2max.htm

46. Secher NH. Physiological and Biomechanical Aspects of Rowing. Sport Med [Internet]. 1993 Jan [cited 2014 Jul 31];15(1):24–42. Available from: http://link.springer.com/10.2165/00007256-199315010-00004

47. Steinacker JM. Physiological aspects of training in rowing. Int J Sports Med [Internet]. 1993 Oct [cited 2014 Jul 31];14 Suppl 1:S3–10. Available from: http://www.ncbi.nlm.nih.gov/pubmed/8262704

48. Hagerman FC. Applied physiology of rowing. Sports Med [Internet]. [cited 2014 Jul 21];1(4):303–26. Available from: http://www.ncbi.nlm.nih.gov/pubmed/6390606

49. Tabata I, Nishimura K, Kouzaki M, Hirai Y, Ogita F, Miyachi M, et al. Effects of moderate-intensity endurance and high-intensity intermittent training on anaerobic capacity and VO2max. Med Sci Sports Exerc [Internet]. 1996 Oct;28(10):1327–30. Available from: http://www.ncbi.nlm.nih.gov/pubmed/8897392

50. Nielsen JJ, Mohr M, Klarskov C, Kristensen M, Krustrup P, Juel C, et al. Effects of high-intensity intermittent training on potassium kinetics and performance in human skeletal muscle. J Physiol [Internet]. 2004 Feb 1 [cited 2014 Jul 22];554(Pt 3):857–70. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1664795&tool=pmcentrez&rendertype=abstract

51. Iaia FM, Hellsten Y, Nielsen JJ, Fernström M, Sahlin K, Bangsbo J. Four weeks of speed endurance training reduces energy expenditure during exercise and maintains muscle oxidative capacity despite a reduction in training volume. J Appl Physiol [Internet]. 2009 Jan 1 [cited 2014 Jul 15];106(1):73–80. Available from: http://jap.physiology.org/content/106/1/73

52. Mohr M, Nordsborg N, Nielsen JJ, Pedersen LD, Fischer C, Krustrup P, et al. Potassium kinetics in human muscle interstitium during repeated intense exercise in relation to fatigue. Pflugers Arch [Internet]. 2004 Jul [cited 2014 Aug 2];448(4):452–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/15048574

53. McKenna MJ, Heigenhauser GJ, McKelvie RS, MacDougall JD, Jones NL. Sprint training enhances ionic regulation during intense exercise in men. J Physiol [Internet]. 1997 Jun 15 [cited 2014 Aug 2];501 (Pt 3:687–702. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1159469&tool=pmcentrez&rendertype=abstract

54. McKenna MJ, Schmidt TA, Hargreaves M, Cameron L, Skinner SL, Kjeldsen K. Sprint training increases human skeletal muscle Na(+)-K(+)-ATPase concentration and improves K+ regulation. J Appl Physiol [Internet]. 1993 Jul [cited 2014 Aug 2];75(1):173–80. Available from: http://www.ncbi.nlm.nih.gov/pubmed/8397176

55. McKenna MJ, Bangsbo J, Renaud J-M. Muscle K+, Na+, and Cl disturbances and Na+-K+ pump inactivation: implications for fatigue. J Appl Physiol [Internet]. 2008 Jan 1 [cited 2014 Aug 2];104(1):288–95. Available from: http://jap.physiology.org/content/104/1/288

56. American College of Sports Medicine Position Stand. The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness, and flexibility in healthy adults. Med Sci Sports Exerc [Internet]. 1998 Jun [cited 2014 Jul 12];30(6):975–91. Available from: http://www.ncbi.nlm.nih.gov/pubmed/9624661

57. Astrand P-O, Saltin B. Maximal oxygen uptake and heart rate in various types of muscular activity. J Appl Physiol [Internet]. 1961 Nov 1 [cited 2014 Jul 31];16(6):977–81. Available from: http://jap.physiology.org/content/16/6/977

58. Conley DL, Krahenbuhl GS. Running economy and distance running performance of highly trained athletes. Med Sci Sports Exerc [Internet]. 1980 Jan 1 [cited 2014 Aug 20];12(5):357–60. Available from: http://europepmc.org/abstract/med/7453514

59. Gaskill SE, Serfass RC, Bacharach DW, Kelly JM. Responses to training in cross-country skiers. Med Sci Sports Exerc [Internet]. 1999 Aug [cited 2014 Aug 20];31(8):1211–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/10449026

60. Millet GP, Dréano P, Bentley DJ. Physiological characteristics of elite short- and long-distance triathletes. Eur J Appl Physiol [Internet]. 2003 Jan [cited 2014 Aug 20];88(4-5):427–30. Available from: http://www.ncbi.nlm.nih.gov/pubmed/12527973

61. Millet GP, Vleck VE, Bentley DJ. Physiological differences between cycling and running: lessons from triathletes. Sports Med [Internet]. 2009 Jan [cited 2014 Aug 5];39(3):179–206. Available from: http://www.ncbi.nlm.nih.gov/pubmed/19290675

62. Oja P, Laukkanen RM, Kukkonen-Harjula TK, Vuori IM, Pasanen ME, Niittymäki SP, et al. Training effects of cross-country skiing and running on maximal aerobic cycle performance and on blood lipids. Eur J Appl Physiol Occup Physiol [Internet]. 1991 Jan [cited 2014 Aug 20];62(6):400–4. Available from: http://www.ncbi.nlm.nih.gov/pubmed/1893902

63. Sandbakk Ø, Sandbakk SB, Ettema G, Welde B. Effects of intensity and duration in aerobic high-intensity interval training in highly trained junior cross-country skiers. J Strength Cond Res [Internet]. 2013 Jul [cited 2014 Aug 20];27(7):1974–80. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23037620

64. Sandbakk Ø, Welde B, Holmberg H-C. Endurance training and sprint performance in elite junior cross-country skiers. J Strength Cond Res [Internet]. 2011 May [cited 2014 Aug 20];25(5):1299–305. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21081854

65. Brahler CJ, Blank SE. VersaClimbing elicits higher VO2max than does treadmill running or rowing ergometry. Med Sci Sports Exerc [Internet]. 1995 Feb 1 [cited 2014 Jul 15];27(2):249–54. Available from: http://europepmc.org/abstract/MED/7723649

66. Quirk JE, Sinning WE. Anaerobic and aerobic responses of males and females to rope skipping. Med Sci Sports Exerc [Internet]. 1982 Jan [cited 2014 Jul 21];14(1):26–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/7070253

67. Town GP, Sol N, Sinning WE. The effect of rope skipping rate on energy expenditure of males and females. Med Sci Sports Exerc [Internet]. 1980 Jan [cited 2014 Jul 30];12(4):295–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/7421480

68. The Metabolic Demands of Kayaking: A review. J Sport Sci Med [Internet]. 2008 [cited 2014 Jul 2];7(1):1–7. Available from: http://www.jssm.org/vol7/n1/1/v7n1-1text.php

69. Tesch PA. Physiological characteristics of elite kayak paddlers. Can J Appl Sport Sci [Internet]. 1983 Jun [cited 2014 Jul 15];8(2):87–91. Available from: http://www.ncbi.nlm.nih.gov/pubmed/6883619

70. De Lira CAB, Peixinho-Pena LF, Vancini RL, de Freitas Guina Fachina RJ, de Almeida AA, Andrade MDS, et al. Heart rate response during a simulated Olympic boxing match is predominantly above ventilatory threshold 2: a cross sectional study. Open access J Sport Med [Internet]. 2013 Jan [cited 2014 Jul 30];4:175–82. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3871409&tool=pmcentrez&rendertype=abstract

71. Guidetti L, Musulin A, Baldari C. Physiological factors in middleweight boxing performance. J Sports Med Phys Fitness [Internet]. 2002 Sep [cited 2014 Jul 30];42(3):309–14. Available from: http://www.ncbi.nlm.nih.gov/pubmed/12094121

72. Kravitz L, Greene L, Burkett Z, Wongsathikun J. Cardiovascular response to punching tempo. J Strength Cond Res [Internet]. 2003 Feb [cited 2014 Jul 22];17(1):104–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/12580664

73. Arseneau E, Mekary S, Léger LA. VO_2 requirements of boxing exercises. J Strength Cond Res [Internet]. 2011 Mar [cited 2014 Jul 30];25(2):348–59. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21217532

74. Beckham SG, Earnest CP. Metabolic cost of free weight circuit weight training. J Sports Med Phys Fitness [Internet]. 2000 Jun 1 [cited 2014 May 28];40(2):118–25. Available from: http://europepmc.org/abstract/MED/11034431

75. Kaikkonen H, Yrjama M, Siljander E, Byman P, Laukkanen R. The effect of heart rate controlled low resistance circuit weight training and endurance training on maximal aerobic power in sedentary adults. Scand J Med Sci Sport [Internet]. 2000 Aug [cited 2014 Aug 1];10(4):211–5. Available from: http://doi.wiley.com/10.1034/j.1600-0838.2000.010004211.x

76. Gotshalk LA, Berger RA, Kraemer WJ. Cardiovascular responses to a high-volume continuous circuit resistance training protocol. J Strength Cond Res [Internet]. 2004 Nov [cited 2014 Aug 4];18(4):760–4. Available from: http://www.ncbi.nlm.nih.gov/pubmed/15574103

77. Hoff J, Gran A, Helgerud J. Maximal strength training improves aerobic endurance performance. Scand J Med Sci Sport [Internet]. 2002 Oct [cited 2014 Jul 22];12(5):288–95. Available from: http://doi.wiley.com/10.1034/j.1600-0838.2002.01140.x

78. Østerås H, Helgerud J, Hoff J. Maximal strength-training effects on force-velocity and force-power relationships explain increases in aerobic performance in humans. Eur J Appl Physiol [Internet]. 2002 Dec [cited 2014 Jul 29];88(3):255–63. Available from: http://www.ncbi.nlm.nih.gov/pubmed/12458369

79. Dalleck LC, Kravitz L. Relationship Between %Heart Rate Reserve And %VO2 Reserve During Elliptical Crosstrainer Exercise. J Sports Sci Med [Internet]. 2006 Jan [cited 2014 Jul 30];5(4):662–71. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3861769&tool=pmcentrez&rendertype=abstract

80. Smith MM, Sommer AJ, Starkoff BE, Devor ST. Crossfit-based high-intensity power training improves maximal aerobic fitness and body composition. J Strength Cond Res [Internet]. 2013 Dec [cited 2014 Jul 31];27(11):3159–72. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23439334

81. Andersen LB. A maximal cycle exercise protocol to predict maximal oxygen uptake. Scand J Med Sci Sports [Internet]. 1995 Jun [cited 2014 Aug 19];5(3):143–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/7552756

82. Smith JC, Hill DW. Contribution of energy systems during a Wingate power test. Br J Sports Med [Internet]. 1991 Dec [cited 2014 Aug 19];25(4):196–9. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1479034&tool=pmcentrez&rendertype=abstract

83. Patton JF, Duggan A. An evaluation of tests of anaerobic power. Aviat Space Environ Med [Internet]. 1987 Mar [cited 2014 Aug 19];58(3):237–42. Available from: http://www.ncbi.nlm.nih.gov/pubmed/3579806

84. Driss T, Vandewalle H. The measurement of maximal (anaerobic) power output on a cycle ergometer: a critical review. Biomed Res Int [Internet]. 2013 Jan [cited 2014 Aug 19];2013:589361. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3773392&tool=pmcentrez&rendertype=abstract

85. Katch V, Weltman A, Martin R, Gray L. Optimal test characteristics for maximal anaerobic work on the bicycle ergometer. Res Q [Internet]. 1977 May [cited 2014 Aug 19];48(2):319–27. Available from: http://www.ncbi.nlm.nih.gov/pubmed/267972

86. Maud PJ, Shultz BB. Norms for the Wingate anaerobic test with comparison to another similar test. Res Q Exerc Sport [Internet]. 1989 Jun [cited 2014 Aug 19];60(2):144–51. Available from: http://www.ncbi.nlm.nih.gov/pubmed/2489835

87. Cooper KH. A means of assessing maximal oxygen intake. Correlation between field and treadmill testing. JAMA [Internet]. 1968 Jan 15 [cited 2014 Aug 18];203(3):201–4. Available from: http://www.ncbi.nlm.nih.gov/pubmed/5694044

88. Klusiewicz A, Faff J. INDIRECT METHODS OF ESTIMATING MAXIMAL OXYGEN UPTAKE ON THE ROWING ERGOMETER. Biol Sport [Internet]. 2003 [cited 2014 Jul 15];20(3):181–94. Available from: http://biolsport.com/fulltxt.php?ICID=6687

89. Jones AM, Doust JH. The validity of the lactate minimum test for determination of the maximal lactate steady state. Med Sci Sports Exerc [Internet]. 1998 Aug [cited 2014 Aug 2];30(8):1304–13. Available from: http://www.ncbi.nlm.nih.gov/pubmed/9710874

90. Jones AM, Carter H. The Effect of Endurance Training on Parameters of Aerobic Fitness. Sport Med [Internet]. 2000 [cited 2014 Jul 23];29(6):373–86. Available from: http://link.springer.com/10.2165/00007256-200029060-00001

91. Poole DC, Gaesser GA. Response of ventilatory and lactate thresholds to continuous and interval training. J Appl Physiol [Internet]. 1985 Apr 1 [cited 2014 Jul 23];58(4):1115–21. Available from: http://jap.physiology.org/content/58/4/1115

92. Fairbarn MS, Blackie SP, McElvaney NG, Wiggs BR, Paré PD, Pardy RL. Prediction of heart rate and oxygen uptake during incremental and maximal exercise in healthy adults. Chest

[Internet]. 1994 May [cited 2014 May 28];105(5):1365–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/8181321

93. Billat L V, Koralsztein JP. Significance of the velocity at VO2max and time to exhaustion at this velocity. Sports Med [Internet]. 1996 Aug [cited 2014 Jul 30];22(2):90–108. Available from: http://www.ncbi.nlm.nih.gov/pubmed/8857705

94. Weyand PG, Sternlight DB, Bellizzi MJ, Wright S. Faster top running speeds are achieved with greater ground forces not more rapid leg movements. J Appl Physiol [Internet]. 2000 Nov 1 [cited 2014 Aug 28];89(5):1991–9. Available from: http://jap.physiology.org/content/89/5/1991

95. Billat V, Renoux JC, Pinoteau J, Petit B, Koralsztein JP. Times to exhaustion at 100% of velocity at VO2max and modelling of the time-limit/velocity relationship in elite long-distance runners. Eur J Appl Physiol Occup Physiol [Internet]. 1994 Jan [cited 2014 Jul 31];69(3):271–3. Available from: http://www.ncbi.nlm.nih.gov/pubmed/8001542

96. Buchheit M, Laursen PB. High-intensity interval training, solutions to the programming puzzle: Part I: cardiopulmonary emphasis. Sports Med [Internet]. 2013 May [cited 2014 Jul 15];43(5):313–38. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23539308

97. Buchheit M, Laursen PB. High-intensity interval training, solutions to the programming puzzle. Part II: anaerobic energy, neuromuscular load and practical applications. Sports Med [Internet]. 2013 Oct [cited 2014 Jul 15];43(10):927–54. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23832851

98. Stepto NK, Hawley JA, Dennis SC, Hopkins WG. Effects of different interval-training programs on cycling time-trial performance. Med Sci Sports Exerc [Internet]. 1999 May [cited 2014 Aug 2];31(5):736–41. Available from: http://www.ncbi.nlm.nih.gov/pubmed/10331896

99. Gunnarsson TP, Bangsbo J. The 10-20-30 training concept improves performance and health profile in moderately trained runners. J Appl Physiol [Internet]. 2012 Jul [cited 2014 May 29];113(1):16–24. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22556401

Training gives us an outlet for suppressed energies created by stress and thus tones the spirit just as exercise conditions the body.

—ARNOLD SCHWARZENEGGER

Glossary

CCSS - The Cardio Code Sports Science 3-day certification
ACE - The American Counsel of Exercise
ACSM - American College of Sports Medicine
JAMA - Journal of the American Medical Association
PUBMED - Online research archive
SAID - Specific Adaptations to Imposed Demands
VO2 - Oxygen uptake
VO2max - Maximal oxygen uptake
O2 - Oxygen
A-V O_2-diff. - Difference between arterial and venous oxygen content of blood.
RA - Right atrium of the heart. Deoxygenated blood returns from the body to this chamber.
RV - Right ventricle of the heart.
LA - Left atrium of the heart. Oxygenated blood coming from the lungs enters the left ventricle
LV - Left ventricle of the heart. The oxygenated blood is ejected from the left ventricle
SVC - Superior Vena Cava. Sometimes also referred to as the thoracic Vena Cava.
IVC - Inferior Vena Cava. Sometimes also referred to as the abdominal Vena Cava.
mmHg - Millimeter Mercury. Used when talking about blood pressure.
CO - Cardiac Output. The amount of blood the heart pumps each heartbeat.
COmax - The maximal cardiac output.
SV - Stroke volume. The amount of blood ejected from the left ventricle each heartbeat.
HR - Heart rate. How fast your heart beats. Usually expressed in beats per minute (BPM).
BPM - Beats per minute
HRmax - Maximal heart rate. The highest attainable heart rate.
vVO2max - The velocity that elicits VO_2max.
Vmax - Maximal velocity. Similar to Wmax.
Vpeak - Highest instantaneous velocity. Similar to Wpeak.
wVO2max - The power output that elicits VO_2max.
W - Watt (joule/s)
Wmax - Maximal power output in Watt.
Wpeak - Highest instantaneous power output measured over a 5 s period in Watt.
AFi - Anaerobic fatigue index
Wlow - Lowest 5 s power output during the Wingate 30 s test in Watt.
MPO - An abbreviation of maximal power output. It is the same as Wmax.
MMA - Mixed Martial Arts
[La] - Lactate
LT - Lactate threshold
OBLA - Onset of blood lactate accumulation
CS - Citrate Synthase
SDH - Succinate Dehydrogenase

CK - Creatine Kinase
PFK - Phosphofructokinase
PCr - Phosphocreatine
LDH -Lactate-dehydrogenase
Cr - Creatine
ATP - Adenosine-Tri-Phosphate. The form of energy used in the body.
ADP - Adenosine-Di-Phosphate. The result after energy has been released.
P - Phosphate
mmol - Milimole
H+ - Hydrogen ion
E - Energy
H2O - Water
CO2 - Carbon-dioxide
l - Liter
m - Meter (1 m = 3 ft. $3^{3/8}$ in.)
s - Second
m/s - Meters per second
km/h - Kilometers per hour
min - Minute
kg - Kilogram (1 kg = 2.2046 lb).
F - Force
d - Distance
t - Time
XC - Cross-country (skiing)
RM - Repetition Maximum. The maximum amount of weight that can be lifted one time
ST - Slow twitch muscle fibers. Low force generating capability. Requires oxygen.
FT - Fast twitch muscle fibers. High force generating capability. Does not require oxygen.
HIT - High Intensity (interval) Training

About the Author

Kenneth Jay is an exercise physiologist and Ph.D. scholar in the effects of physical and mental exercise on musculoskeletal pain and stress. With more than 15 years of experience working with the elite, Kenneth Jay not only knows about the science of performance, but he also understands how to apply it for fast and optimal results. With numerous peer-reviewed published articles on the effects of physical training on pain and performance, Kenneth Jay is known for his no-nonsense, research-based dissection of physical training to provide peak performance.

Apart from being a published international recognized researcher and a Ph.D. scholar in the medical sciences, Kenneth Jay gives lectures and workshops on training, pain rehabilitation, performance optimization, and stress. He is also a guest researcher at the University of Southampton, University of Copenhagen and University of Southern Denmark.

To balance out all the research related activities, Kenneth Jay consults a variety of organizations and individuals requiring optimized testing, planning, and programming of their sport or help getting ready for specific work tasks. Some of the profiles Kenneth Jay has consulted include: The Danish Special Forces, the Danish Military Police, the Danish Army, the Danish Police, the Danish Swimming Federation, the Danish Wrestling Federation, the Danish Badminton Federation, the Danish Ping Pong Federation, and the Royal Danish Ballet.

Additionally, Kenneth Jay has worked, and still works as a consultant for; professional MMA fighters, actors, individual sport athletes, along with a long list of fitness and figure competitors, bodybuilders, circus performers, ballet dancers, professional strippers (yes that's correct!), and racecar drivers.

When Kenneth Jay is not working, he spends most of his time with his two sons and his wife in a small house in Denmark. He is also a nationally ranked arm wrestler and aspiring martial artist.

In 2011 Kenneth was diagnosed with skin cancer (malignant melanoma) and has since then looked extensively at the research into cancer and the link to stress and behavior.

When Kenneth Jay is not reading, studying and developing certifications, he spends his time with his wife and two sons, training and cultivating his body and mind.

Kenneth Jay teaches certification workshops and consults individuals, as well as companies, all over the world and can be contacted at kj@cardiocode.dk. You can also get an overview of the four major certifications Kenneth teaches at fastforcefirst.com.

"I don't criticize weight training - as long as it is not a substitute for aerobic training."

Kenneth H. Cooper

The fitness industry today is filled with myth and fallacies of performance training and optimization. One of the more prominent fallacies pertaining to cardio-vascular exercise is that if your heart rate is high and you are breathing heavy, it provides the necessary stimulus for it to be termed "cardio". This fallacy is often taken advantage of by trainers promoting high intensity weight training with limited rest periods and a fast lifting tempo as cardio-vascular exercise. However, the physiological mechanisms of the heart and circulatory system of the body respond quite differently during typical resistance training, and this response ultimately limits the adaptations cardio-vascular training is supposed to stimulate.

The physiology of the human body is far from simple. There is always a cardio-vascular response during any type of activity, but in order for an activity to qualify as "cardio-vascular," it has to stimulate appropriate adaptations to the heart and circulatory system, and not all physical activities do this equally. These factors are what have motivated me to write this book. As an exercise physiologist with a specialty in weight training and cardio-vascular exercise, as well as being a performance consultant and educator of fitness professionals, I feel there is a need to provide physiologically correct information so that myths and fallacies can be eliminated from the fitness industry. This book is about providing truthful information so trainers and athletes can make the best possible choice in their training. If you, as a fitness instructor, personal trainer, or coach deliver accurate information founded in the scientific literature, you will not only create the best results, but your credibility as a professional will also skyrocket. If you want to change your physical appearance and performance level, or you help other people in doing so, having **correct** knowledge about the human body, and how it responds to exercise, will lead to the fastest and most sustainable results.

In this book, I set out to answer one primary question:

What constitutes real cardio-vascular training?

Answering this question takes of-set in the physiology of the human body and digs into the research that cements the fallacy of current beliefs about "cardio". The book should be viewed as an introductory "light-weight" textbook to cardio-vascular training, how it is done correctly, and the effects on the body it imposes. By going over the current scientific literature, distilling it, and putting it together with established physiological knowledge, I have tried to provide a framework from which you can **test**, **design**, **optimize,** and **plan** real cardio-vascular training and get all the benefits of increased heart health, longevity, and vitality in conjunction with all the performance benefits of increased **power-endurance, recovery ability, stamina, fat burning capability,** and **insulin sensitivity**. Whether you are a recreational athlete, a high level sports performer, a stay-at-home mom, or a keyboard athlete, there are tremendous benefits of exercising your heart, but you have to do it correctly! This book will show you how.

Your heart is the most important muscle in your entire body. Give it the attention it deserves.

"All progress starts by telling the truth."

Dan Sullivan

Here is the truth about cardio-vascular training!