

**PENGARUH INTERVAL TRAINING TERHADAP PENINGKATAN
KAPASITAS ANAEROB BERKAITAN DENGAN PERFORMA ATLET
PENCAK SILAT**

TESIS

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Memperoleh Gelar Magister Pendidikan
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Pengaruh *Interval Training* terhadap Peningkatan Kapasitas Anaerobik berkaitan dengan Performa Atlet Pencak Silat

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ABSTRAK

Prestasi seorang atlet pencak silat diharapkan meningkat, apabila didukung kapasitas anaerobik yang baik serta program yang diberikan sesuai dengan kebutuhan yaitu program interval training. Tujuan penelitian ini untuk mengetahui pengaruh *interval training* terhadap peningkatan kapasitas anaerobik berkaitan dengan performa atlet pencak silat. Penelitian ini menggunakan metode *ex post facto*. Sampel dalam penelitian ini adalah Atlet Pencak Silat Jawa Barat yang menghadapi PON XX tahun 2020 di Papua berjumlah 20 orang dengan usia ($26.25+4.216$), tinggi badan ($170.70+3.658$), berat badan ($64.50+11.048$), pengalaman latihan ($8.35+3.602$). Teknik pengambilan sampel menggunakan total sampling. Instrumen tes merujuk pada *Running Anaerobic Sprint Test* (RAST) untuk mengukur kapasitas anaerob dengan lama latihan selama 6 minggu. Teknik analisis data menggunakan analisis statistika dengan uji t dan uji r berbantuan SPSS 25. Hasil penelitian menunjukkan terdapat pengaruh *interval training* terhadap kapasitas anaerobik berkaitan dengan performa atlet pencak silat. Hal ini dibuktikan dengan hasil uji t menunjukkan bahwa nilai kapasitas anerobic memiliki sig (2-tailed) $0,029<0,05$. Hasil uji r menunjukkan nilai signifikansi $0,000<0,05$ artinya terdapat hubungan yang berarti antara kapasitas anaerob atlet pencak silat dengan performa setelah dilakukan *interval training*.

Kata kunci: Anaerobik, atlet pencak silat, *interval training*, performa.

The Effect of Interval Training on Anaerobic Capacity Improvement related to the Performance of Pencak Silat Athletes

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ABSTRACT

The achievement of a pencak silat athlete is expected to increase, if it is supported by good anaerobic capacity and the program is provided according to the needs, namely the interval training program. The purpose of this study was to determine the effect of interval training on increasing anaerobic capacity related to the performance of pencak silat athletes. This research uses ex post facto method. The sample in this study were Pencak Silat Athletes West Java regional facing the XX PON in 2020 in Papua totaling 20 people with age (26.25+4.216), height (170.70+3.658), weight (64.50+11.048), experience practice (8.35+3.602). The sampling technique used was total sampling. The test instrument refers to the Running Anaerobic Sprint Test (RAST) to measure anaerobic capacity with 6 weeks of exercise. The data analysis technique used statistical analysis with t test and r test assisted by SPSS 25. The results showed that there was an effect of interval training on anaerobic capacity related to the performance of pencak silat athletes. This is evidenced by the results of the t test showing that the anaerobic capacity value has a sig (2-tailed) $0.029<0.05$. The results of the r-test showed a significance value of $0.000<0.05$, meaning that there was a significant relationship between the anaerobic capacity of pencak silat athletes and their performance after interval training.

Keywords: Anaerobic, pencak silat athlete, interval training, performance.

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DAFTAR PUSTAKA

- Ali, Kamran., Mohammed Ejaz Hasan, Verma Shalini., Ahmad Irshad. (2017). *Complex Training: An Update. Journal of Athletic Enhancement*, Volume 06(Issue03), hlm. 1-5.
- Alves Jose' Manuel Vilaca Maio., Rebelo Anto' Nio Natal ., Abrantes Catarina., and Sampaio Jaime. (2010). *Short-Term Effects Of Complex And Contrast Training In Soccer Players, Vertical Jump, Sprint, And Agility Abilities*, hlm. 936–941.
- Akgül, M. S. (2018). Effect of Wingate-based high intensity interval training on aerobic and anaerobic performance of kick boxers. *Physical Education of Students*, 23(4), 167–171. <https://doi.org/10.15561/20755279.2019.0401>
- Andrade, V. L., Zagatto, A. M., Kalva-Filho, C. A., Mendes, O. C., Gobatto, C. A., Campos, E. Z., & Papoti, M. (2015). Running-based anaerobic sprint test as a procedure to evaluate anaerobic power. *International Journal of Sports Medicine*, 36(14), 1156–1162. <https://doi.org/10.1055/s-0035-1555935>
- Aursen, P. a U. L. B. L., Hing, C. E. M. S., Eake, J. O. M. P., & Oombes, J. E. F. F. S. C. (2015). Influence of High -Intensity Interval Training. Electronic Components and Technology Conference, 19(3), 527–533.
- Andreato, L.V., Julio, U.F., Panissa, Valeria, L.G., Esteves, J.V.D.C., Hardt, F., De Moraes, S.M.F., Franchini, E. (2015). Brazilian Jiu-Jitsu Simulated Competition Part I: Metabolic, Hormonal, Cellular Damage, And Heart Rate Responses. *Journal of Strength and Conditioning Research*, 29(9), hlm. 2538–2549.
- Aneira, M.A., Santos., Janeira Manuel A.A.S., (2008). Effects of Complex Training on Explosive Strength in Adolescent Male Basketball Players. *Strength And Conditioning*, 22(3), hlm. 903–909.
- Atakan, M. M., Li, Y., Ko\csar, \c{S}ükran Nazan, Turnagöl, H. H., & Yan, X. (2021). Evidence-based effects of high-intensity interval training on exercise capacity and health: a review with historical perspective. *International Journal of Environmental Research and Public Health*, 18(13), 7201.
- Chaouachi, A., Hammami, R., Kaabi, S., Chamari, K., Drinkwater, E. J., & Behm, D. G. (2014). Olympic weightlifting and plyometric training with children provides similar or greater performance improvements than traditional resistance training. *The Journal of Strength & Conditioning Research*, 28(6), 1483-1496.
- Akgül, M. S. (2018). Effect of Wingate-based high intensity interval training on aerobic and anaerobic performance of kick boxers. *Physical Education of Students*, 23(4), 167–171. <https://doi.org/10.15561/20755279.2019.0401>
- Andrade, V. L., Zagatto, A. M., Kalva-Filho, C. A., Mendes, O. C., Gobatto, C. A., Campos, E. Z., & Papoti, M. (2015). Running-based anaerobic sprint test as a procedure to evaluate anaerobic power. *International Journal of Sports*

- Medicine*, 36(14), 1156–1162. <https://doi.org/10.1055/s-0035-1555935>
- Anshel, M. H. et al. (1991). *Dictionary of The Sport and Exercise Sciences*. Champaign, Illinois: Human Kinetics Book.
- Atakan, M. M., Li, Y., Ko\csar, \cSükran Nazan, Turnagöl, H. H., & Yan, X. (2021). Evidence-based effects of high-intensity interval training on exercise capacity and health: a review with historical perspective. *International Journal of Environmental Research and Public Health*, 18(13), 7201.
- Aursen, P. a U. L. B. L., Hing, C. E. M. S., Eake, J. O. M. P., & Oombes, J. E. F. F. S. C. (2015). Influence of High -Intensity Interval Training. *Electronic Components and Technology Conference*, 19(3), 527–533.
- Baumgartner & Jackson. (1999). *Measurment for Evaluation in Physical Education and Exersice Science* (6th ed.). Boston : Mc Graw-Hill.
- Berahim, M., & Kassim, M. (2016). Analysis of physical fitness test on junior football players. *Journal of Scientific Research and Development*, 3(4), 15–23.
- Beyer, K. S., Stout, J. R., Redd, M. J., Baker, K. M., Church, D. D., Bergstrom, H. C., Hoffman, J. R., & Fukuda, D. H. (2020). Effect of somatic maturity on the aerobic and anaerobic adaptations to sprint interval training. *Physiological Reports*, 8(9), 1–12. <https://doi.org/10.14814/phy2.14426>
- Billat, V. L., Flechet, B., Petit, B., Muriaux, G., & Koralsztein, J.-P. (1999). Interval training at VO₂max: effects on aerobic performance and overtraining markers. *Medicine and Science in Sports and Exercise*, 31(1), 156–163.
- Billaut, F., Gore, C. J., & Aughey, R. J. (2012). Enhancing team-sport athlete performance: Is altitude training relevant? In *Sports Medicine*. <https://doi.org/10.2165/11634050-00000000-00000>
- Botonis, P. G., Toubekis, A. G., Terzis, G. D., Geladas, N. D., & Platanou, T. I. (2019). Effects of Concurrent Strength and High-Intensity Interval Training on Fitness and Match Performance in Water-Polo Players. *Journal of Human Kinetics*, 67(1), 175–184. <https://doi.org/10.2478/hukin-2019-0001>
- Bray, S. R., & Martin, K. A. (2003). The effect of competition location on individual athlete performance and psychological states. *Psychology of Sport and Exercise*. [https://doi.org/10.1016/S1469-0292\(01\)00032-2](https://doi.org/10.1016/S1469-0292(01)00032-2)
- Buchheit, M., & Laursen, P. B. (2013). High-intensity interval training, solutions to the programming puzzle: Part I: Cardiopulmonary emphasis. *Sports Medicine*, 43(5), 313–338. <https://doi.org/10.1007/s40279-013-0029-x>
- Contreras, C., & others. (2020). *The Effect of a 6-Week High Intensity Interval Training Program on Aerobic and Anaerobic Fitness in Collegiate Dancers*.
- Crewther, B. T., Kilduff, L. P., Cook, C. J., Middleton, M. K., Bunce, P. J., & Yang, G. Z. (2011). The acute potentiating effects of back squats on athlete performance. *Journal of Strength and Conditioning Research*. <https://doi.org/10.1519/JSC.0b013e318215f560>

- Daniels, J., & Scardina, N. (1984). Interval Training and Performance. *Sports Medicine: An International Journal of Applied Medicine and Science in Sport and Exercise*, 1(4), 327–334. <https://doi.org/10.2165/00007256-198401040-00006>
- Disampaikan Pada Kegiatan Pelatihan Metodologi Penelitian Pendidikan, Mp. (2013). *Penelitian Ex Post Facto*. 1–8.
- Doewes, M. (2013). Kapasitas Kerja Fisik. *Sport Science*.
- Domaradzki, J., Cichy, I., Rokita, A., & Popowczak, M. (2020). Effects of tabata training during physical education classes on body composition, aerobic capacity, and anaerobic performance of under-, normal-and overweight adolescents. *International Journal of Environmental Research and Public Health*, 17(3). <https://doi.org/10.3390/ijerph17030876>
- Foster, C., Farland, C. V., Guidotti, F., Harbin, M., Roberts, B., Schuette, J., Tuuri, A., Doberstein, S. T., & Porcari, J. P. (2015). The effects of high intensity interval training vs steady state training on aerobic and anaerobic capacity. *Journal of Sports Science & Medicine*, 14(4), 747.
- Fox E.L, Bowers R.W, F. M. . (1993). *The Physiological Basis for Exercise and Sport*. 5th. Ed. Boston-USA. WCB/McGraw-Hill.
- Ganong. William. (1995). *Riview of Medical Physiology*. Seventeenth edition. San Fransisco, US :. Prentice- Hall International Inc.
- Garc\'ia-Hermoso, A., Cerrillo-Urbina, A. J., Herrera-Valenzuela, T., Cristi-Montero, C., Saavedra, J. M., & Mart\'inez-Vizca\'ino, V. (2016). Is high-intensity interval training more effective on improving cardiometabolic risk and aerobic capacity than other forms of exercise in overweight and obese youth? A meta-analysis. *Obesity Reviews*, 17(6), 531–540.
- Gastin, P. B. (1994). Quantification of anaerobic capacity. In *Scandinavian Journal of Medicine & Science in Sports*. <https://doi.org/10.1111/j.1600-0838.1994.tb00411.x>
- Gibala, M. J. (2015). Physiological adaptations to low-volume high-intensity interval training. *Sports Science Exchange*, 28(139), 1–6.
- Gibala, M. J., Little, J. P., MacDonald, M. J., & Hawley, J. A. (2012). Physiological adaptations to low-volume, high-intensity interval training in health and disease. *The Journal of Physiology*, 590(5), 1077–1084.
- Gillen, J. B., & Gibala, M. J. (2014). Is high-intensity interval training a time-efficient exercise strategy to improve health and fitness? *Applied Physiology, Nutrition and Metabolism*, 39(3), 409–412. <https://doi.org/10.1139/apnm-2013-0187>
- Gist, N. H., Fedewa, M. V., Dishman, R. K., & Cureton, K. J. (2014). Sprint interval training effects on aerobic capacity: A systematic review and meta-analysis. *Sports Medicine*, 44(2), 269–279. <https://doi.org/10.1007/s40279-013-0115-0>
- Green, S. (1994). A definition and systems view of anaerobic capacity. *European*

Journal of Applied Physiology and Occupational Physiology.
<https://doi.org/10.1007/BF00609411>

- Guyton, A. C., Hall, J. E. (2014). *Buku Ajar Fisiologi Kedokteran Edisi 12*. Jakarta : EGC.
- Harsono. (2016). *Latihan Kondisi Fisik* (p. 1). PT Remaja Rosdakarya.
- Hartono, A. (2013). Predominan Sistem Energi Dalam Pencak Silat Kategori Tanding. *Journal of Chemical Information and Modeling*, 53(9), 427–440.
- Hazell, T. J., MacPherson, R. E. K., Gravelle, B. M. R., & Lemon, P. W. R. (2010). 10 or 30-S Sprint Interval Training Bouts Enhance Both Aerobic and Anaerobic Performance. *European Journal of Applied Physiology*, 110(1), 153–160. <https://doi.org/10.1007/s00421-010-1474-y>
- Huang, H., Liu, B., Liu, L., & Song, S. (2017). Jasmonate action in plant growth and development. *Journal of Experimental Botany*, 68(6), 1349–1359.
- Hurst, C., Scott, J. P. R., Weston, K. L., & Weston, M. (2019). High-intensity interval training: a potential exercise countermeasure during human spaceflight. *Frontiers in Physiology*, 10, 581.
- Immawati, A. (2011). Pengaruh Pemberian Sport Drink terhadap Performa dan Tes Keterampilan pada Atlet Sepak Bola Usia 15-18 Tahun. *Universitas Dipenogoro 2011*.
- Isnaini, lalu moh yuda. (2019). *Diajukan sebagai salah satu syarat untuk memperoleh gelar Doktor Pendidikan Pada Universitas Negeri Semarang*.
- Ito, S. (2019). High-intensity interval training for health benefits and care of cardiac diseases-the key to an efficient exercise protocol. *World Journal of Cardiology*, 11(7), 171.
- Kaminagakura, E. I., Zagatto, A. M., Redkva, P. E., Gomes, E. B., Loures, J. P., Kalva-Filho, C. A., & Papoti, M. (2012). Can the running-based anaerobic sprint test be used to predict anaerobic capacity? *Journal of Exercise Physiology Online*, 15(2), 90–99.
- Kriswanto, E. S., Setijono, H., & Mintarto, E. (2019). Exercise ratio 1:2; Changes of anaerobic threshold and lactate acid level. *Annals of Tropical Medicine and Public Health*, 22(11). <https://doi.org/10.36295/ASRO.2019.221130>
- Krustrup, P., Mohr, M., & Bangsbo, J. (2002). Activity profile and physiological demands of top-class soccer assistant refereeing in relation to training status. *Journal of Sports Sciences*. <https://doi.org/10.1080/026404102320761778>
- Lahart, I., & Robertson, P. (2009). Strength and conditioning programme design for combat sports. *Advances in Strength and Conditioning Research*, November, 189–216.
- Lubis, J. (2013). *Panduan Praktis Penyusunan Program Latihan*. PT Raja Grafindo Persada.

- MacDonald, C. J., Lamont, H. S., & Garner, J. C. (2012). A comparison of the effects of 6 weeks of traditional resistance training, plyometric training, and complex training on measures of strength and anthropometrics. *The Journal of Strength & Conditioning Research*, 26(2), 422–431.
- MacDougall, J.D, Wenger, H.A, Green, H. J. (1982). *Physiological Testing of the Elite Athlete*. New York: Mouvement Publications.
- MacKenzie, B. (2005). *101 Performance Evaluation Tests*. London : Electric Word plc.
- McArdle, W.D., Katch, F.I. & Katch, V. L. (1986). *Exercise Physiology : Energy, Nutrition, and Human Performance*.2nd. Ed. Lea & Febiger, Philadelphia.
- Meckel, Y., Gefen, Y., Nemet, D., & Eliakim, A. (2012). Influence of short vs. long repetition sprint training on selected fitness components in young soccer players. *The Journal of Strength & Conditioning Research*, 26(7), 1845–1851.
- Medbo, J. I., Mohn, A. C., Tabata, I., Bahr, R., Vaage, O., & Sejersted, O. M. (1988). Anaerobic capacity determined by maximal accumulated O₂ deficit. *Journal of Applied Physiology*. <https://doi.org/10.1152/jappl.1988.64.1.50>
- Mihai, C. (2011). Force – The Only Conditional Quality? Points of View on Certain Aspects of Theory of Sports Training. *International Journal of Wrestling Science*, 1(2), 79–85. <https://doi.org/10.1080/21615667.2011.10878937>
- Milanović, Z., Sporiš, G., & Weston, M. (2015). Effectiveness of high-intensity interval training (HIT) and continuous endurance training for VO_{2max} improvements: a systematic review and meta-analysis of controlled trials. *Sports Medicine*, 45(10), 1469–1481.
- Pate. (1984). *Dasar-Dasar Ilmiah Kepelatihan*. Saunders College Publishing, Philadelphia New York Chicago.
- Pate, R. R. (1991). Health-Related Measures of Children's Physical Fitness. *Journal of School Health*. <https://doi.org/10.1111/j.1746-1561.1991.tb06021.x>
- Rosenblat, M. A., Perrotta, A. S., & Thomas, S. G. (2020). Effect of High-Intensity Interval Training Versus Sprint Interval Training on Time-Trial Performance: A Systematic Review and Meta-analysis. *Sports Medicine*, 50(6), 1145–1161. <https://doi.org/10.1007/s40279-020-01264-1>
- Ruddock, A., James, L., French, D., Rogerson, D., Driller, M., & Hembrough, D. (2021). High-intensity conditioning for combat athletes: practical recommendations. *Applied Sciences*, 11(22), 10658.
- Scott, J. R. (1998). Fox's Physiological Basis for Exercise and Sport, 6th Edition. *Medicine & Science in Sports & Exercise*. <https://doi.org/10.1097/00005768-199812000-00016>
- Sheykhlovand, M., Gharaat, M., Bishop, P., Khalili, E., Karami, E., & Fereshtian, S. (2015). Anthropometric, physiological, and performance characteristics of

- elite canoe polo players. *Psychology & Neuroscience*, 8(2), 257.
- Sindiani, M., Eliakim, A., Segev, D., & Meckel, Y. (2017). The effect of two different interval-training programmes on physiological and performance indices. *European Journal of Sport Science*, 17(7), 830–837. <https://doi.org/10.1080/17461391.2017.1321687>
- Sloth, M., Sloth, D., Overgaard, K., & Dalgas, U. (2013). Effects of sprint interval training on VO_{2max} and aerobic exercise performance: A systematic review and meta-analysis. *Scandinavian Journal of Medicine and Science in Sports*, 23(6), 341–352. <https://doi.org/10.1111/sms.12092>
- Sözen, H., & Akyıldız, C. (2018). The Effects of Aerobic and Anaerobic Training on Aerobic and Anaerobic Capacity. *International Journal of Anatolia Sport Sciences*. <https://doi.org/10.5505/jiasscience.2018.68077>
- Subekti, N., Syaukani, A. A., & Fatoni, M. (2019). Measurement of Anaerobic Capacity Based On Fatigue Index for Pencak Silat Athletes on Combat Category. *International Summit on Science Technology and Humanity*, 681–686.
- Sukadiyanto. (2011). *Pengantar Teori dan Metodologi Melatih Fisik*. Bandung: Lubuk Agung.
- Sumetry, R., Syafrudin, & Gusril. (2021). The efficacy of anaerobic capacity interval training on kick endurance of pencaksilat athletes. *Annals of Agri Bio Research*, 26(2), 209–213.
- Susanto, D. M., Maidarman, Suwirman, & Heru syrarli, L. (2020). Kondisi Fisik Atlet Pencak Silat. *Jurnal Patriot*, 2(2018), 692–704.
- Syaifullah, R., & Doewes, R. I. (2020). Pencak silat talent test development. *International Journal of Human Movement and Sports Sciences*, 8(6), 361–368. <https://doi.org/10.13189/saj.2020.080607>
- Terada, T., Toghi Eshghi, S. R., Liubaoerjijin, Y., Kennedy, M., Myette-Côté, E., Fletcher, K., & Boulé, N. G. (2019). Overnight fasting compromises exercise intensity and volume during sprint interval training but improves high-intensity aerobic endurance. *J. Sports Med. Phys. Fit*, 59, 357–365.
- University, O. (2020). *The Basics Of Physical Conditioning*. USA: Ohio University.
- Westra, H. G., De Haan, A., Van Doorn, J. E., & De Haan, E. J. (1985). The effect of intensive interval training on the anaerobic power of the rat quadriceps muscle. *Journal of Sports Sciences*, 3(2), 139–150. <https://doi.org/10.1080/02640418508729743>
- Wiguna, I. B. (2017). *Teori dan Aplikasi Latihan Kondisi Fisik*. Depok: Rajawali Pers.
- Wibowo, K. A. (2017). Pengaruh Self Control dan Motivasi Diri terhadap Peak Performance Pemain PS. UNNES. *Skripsi*. Universitas Negeri Semarang.

- Zafar Sidik, dkk. (2013), Dampak Penerapan “Complex Training” Terhadap peningkatan Kemampuan Dinamis Anaerobik, *Jurnal Juara IPTEK Olahraga* Vol. 1 No. 1 Januari – April 2013 Bidang Sport Science & Penerapan Iptek Olahraga KONI Pusat, hlm. 7–33.
- Zupan, M. F., Arata, A. W., Dawson, L. H., Wile, A. L., Payn, T. L., & Hannon, M. E. (2009). Wingate Anaerobic Test Peak Power And Anaerobic Capacity Classifications For Men And Women Intercollegiate Athletes. *Journal of Strength and Conditioning Research / National Strength & Conditioning Association*, 23(9), hlm. 2598–2604.
- Akgül, M. S. (2018). Effect of Wingate-based high intensity interval training on aerobic and anaerobic performance of kick boxers. *Physical Education of Students*, 23(4), 167–171. <https://doi.org/10.15561/20755279.2019.0401>
- Andrade, V. L., Zagatto, A. M., Kalva-Filho, C. A., Mendes, O. C., Gobatto, C. A., Campos, E. Z., & Papoti, M. (2015). Running-based anaerobic sprint test as a procedure to evaluate anaerobic power. *International Journal of Sports Medicine*, 36(14), 1156–1162. <https://doi.org/10.1055/s-0035-1555935>
- Anshel, M. H. et al. (1991). *Dictionary of The Sport and Exercise Sciences*. Champaign, Illinois: Human Kinetics Book.
- Atakan, M. M., Li, Y., Ko\csar, \cSükran Nazan, Turnagöl, H. H., & Yan, X. (2021). Evidence-based effects of high-intensity interval training on exercise capacity and health: a review with historical perspective. *International Journal of Environmental Research and Public Health*, 18(13), 7201.
- Aursten, P. a U. L. B. L., Hing, C. E. M. S., Eake, J. O. M. P., & Oombes, J. E. F. F. S. C. (2015). Influence of High -Intensity Interval Training. *Electronic Components and Technology Conference*, 19(3), 527–533.
- Baumgartner & Jackson. (1999). *Measurment for Evaluation in Physical Education and Exersice Science* (6th ed.). Boston : Mc Graw-Hill.
- Berahim, M., & Kassim, M. (2016). Analysis of physical fitness test on junior football players. *Journal of Scientific Research and Development*, 3(4), 15–23.
- Beyer, K. S., Stout, J. R., Redd, M. J., Baker, K. M., Church, D. D., Bergstrom, H. C., Hoffman, J. R., & Fukuda, D. H. (2020). Effect of somatic maturity on the aerobic and anaerobic adaptations to sprint interval training. *Physiological Reports*, 8(9), 1–12. <https://doi.org/10.14814/phy2.14426>
- Billat, V. L., Flechet, B., Petit, B., Muriaux, G., & Koralsztein, J.-P. (1999). Interval training at VO₂max: effects on aerobic performance and overtraining markers. *Medicine and Science in Sports and Exercise*, 31(1), 156–163.
- Billaut, F., Gore, C. J., & Aughey, R. J. (2012). Enhancing team-sport athlete performance: Is altitude training relevant? In *Sports Medicine*. <https://doi.org/10.2165/11634050-00000000-00000>
- Botonis, P. G., Toubekis, A. G., Terzis, G. D., Geladas, N. D., & Platanou, T. I.

- (2019). Effects of Concurrent Strength and High-Intensity Interval Training on Fitness and Match Performance in Water-Polo Players. *Journal of Human Kinetics*, 67(1), 175–184. <https://doi.org/10.2478/hukin-2019-0001>
- Bray, S. R., & Martin, K. A. (2003). The effect of competition location on individual athlete performance and psychological states. *Psychology of Sport and Exercise*. [https://doi.org/10.1016/S1469-0292\(01\)00032-2](https://doi.org/10.1016/S1469-0292(01)00032-2)
- Buchheit, M., & Laursen, P. B. (2013). High-intensity interval training, solutions to the programming puzzle: Part I: Cardiopulmonary emphasis. *Sports Medicine*, 43(5), 313–338. <https://doi.org/10.1007/s40279-013-0029-x>
- Contreras, C., & others. (2020). *The Effect of a 6-Week High Intensity Interval Training Program on Aerobic and Anaerobic Fitness in Collegiate Dancers*.
- Crewther, B. T., Kilduff, L. P., Cook, C. J., Middleton, M. K., Bunce, P. J., & Yang, G. Z. (2011). The acute potentiating effects of back squats on athlete performance. *Journal of Strength and Conditioning Research*. <https://doi.org/10.1519/JSC.0b013e318215f560>
- Daniels, J., & Scardina, N. (1984). Interval Training and Performance. *Sports Medicine: An International Journal of Applied Medicine and Science in Sport and Exercise*, 1(4), 327–334. <https://doi.org/10.2165/00007256-198401040-00006>
- Disampaikan Pada Kegiatan Pelatihan Metodologi Penelitian Pendidikan, Mp. (2013). *Penelitian Ex Post Facto*. 1–8.
- Doewes, M. (2013). Kapasitas Kerja Fisik. *Sport Science*.
- Domaradzki, J., Cichy, I., Rokita, A., & Popowczak, M. (2020). Effects of tabata training during physical education classes on body composition, aerobic capacity, and anaerobic performance of under-, normal-and overweight adolescents. *International Journal of Environmental Research and Public Health*, 17(3). <https://doi.org/10.3390/ijerph17030876>
- Foster, C., Farland, C. V., Guidotti, F., Harbin, M., Roberts, B., Schuette, J., Tuuri, A., Doberstein, S. T., & Porcari, J. P. (2015). The effects of high intensity interval training vs steady state training on aerobic and anaerobic capacity. *Journal of Sports Science & Medicine*, 14(4), 747.
- Fox E.L, Bowers R.W, F. M. . (1993). *The Physiological Basis for Exercise and Sport*. 5th. Ed. Boston-USA. WCB/McGraw-Hill.
- Ganong. William. (1995). *Riview of Medical Physiology*. Seventeenth edition. San Fransisco, US :. Prentice- Hall International Inc.
- García-Hermoso, A., Cerrillo-Urbina, A. J., Herrera-Valenzuela, T., Cristi-Montero, C., Saavedra, J. M., & Martínez-Vizcaíno, V. (2016). Is high-intensity interval training more effective on improving cardiometabolic risk and aerobic capacity than other forms of exercise in overweight and obese youth? A meta-analysis. *Obesity Reviews*, 17(6), 531–540.
- Gastin, P. B. (1994). Quantification of anaerobic capacity. In *Scandinavian Journal*

of Medicine & Science in Sports. <https://doi.org/10.1111/j.1600-0838.1994.tb00411.x>

Gibala, M. J. (2015). Physiological adaptations to low-volume high-intensity interval training. *Sports Science Exchange*, 28(139), 1–6.

Gibala, M. J., Little, J. P., MacDonald, M. J., & Hawley, J. A. (2012). Physiological adaptations to low-volume, high-intensity interval training in health and disease. *The Journal of Physiology*, 590(5), 1077–1084.

Gillen, J. B., & Gibala, M. J. (2014). Is high-intensity interval training a time-efficient exercise strategy to improve health and fitness? *Applied Physiology, Nutrition and Metabolism*, 39(3), 409–412. <https://doi.org/10.1139/apnm-2013-0187>

Gist, N. H., Fedewa, M. V., Dishman, R. K., & Cureton, K. J. (2014). Sprint interval training effects on aerobic capacity: A systematic review and meta-analysis. *Sports Medicine*, 44(2), 269–279. <https://doi.org/10.1007/s40279-013-0115-0>

Green, S. (1994). A definition and systems view of anaerobic capacity. *European Journal of Applied Physiology and Occupational Physiology*. <https://doi.org/10.1007/BF00609411>

Guyton, A. C., Hall, J. E. (2014). *Buku Ajar Fisiologi Kedokteran Edisi 12*. Jakarta : EGC.

Harsono. (2016). *Latihan Kondisi Fisik* (p. 1). PT Remaja Rosdakarya.

Hartono, A. (2013). Predominan Sistem Energi Dalam Pencak Silat Kategori Tanding. *Journal of Chemical Information and Modeling*, 53(9), 427–440.

Hazell, T. J., MacPherson, R. E. K., Gravelle, B. M. R., & Lemon, P. W. R. (2010). 10 or 30-S Sprint Interval Training Bouts Enhance Both Aerobic and Anaerobic Performance. *European Journal of Applied Physiology*, 110(1), 153–160. <https://doi.org/10.1007/s00421-010-1474-y>

Huang, H., Liu, B., Liu, L., & Song, S. (2017). Jasmonate action in plant growth and development. *Journal of Experimental Botany*, 68(6), 1349–1359.

Hurst, C., Scott, J. P. R., Weston, K. L., & Weston, M. (2019). High-intensity interval training: a potential exercise countermeasure during human spaceflight. *Frontiers in Physiology*, 10, 581.

Immawati, A. (2011). Pengaruh Pemberian Sport Drink terhadap Performa dan Tes Keterampilan pada Atlet Sepak Bola Usia 15-18 Tahun. *Universitas Dipenogoro 2011*.

Isnaini, lalu moh yuda. (2019). *Diajukan sebagai salah satu syarat untuk memperoleh gelar Doktor Pendidikan Pada Universitas Negeri Semarang*.

Ito, S. (2019). High-intensity interval training for health benefits and care of cardiac diseases-the key to an efficient exercise protocol. *World Journal of Cardiology*, 11(7), 171.

- Kaminagakura, E. I., Zagatto, A. M., Redkva, P. E., Gomes, E. B., Loures, J. P., Kalva-Filho, C. A., & Papoti, M. (2012). Can the running-based anaerobic sprint test be used to predict anaerobic capacity? *Journal of Exercise Physiology Online*, 15(2), 90–99.
- Kriswanto, E. S., Setijono, H., & Mintarto, E. (2019). Exercise ratio 1:2; Changes of anaerobic threshold and lactate acid level. *Annals of Tropical Medicine and Public Health*, 22(11). <https://doi.org/10.36295/ASRO.2019.221130>
- Krustrup, P., Mohr, M., & Bangsbo, J. (2002). Activity profile and physiological demands of top-class soccer assistant refereeing in relation to training status. *Journal of Sports Sciences*. <https://doi.org/10.1080/026404102320761778>
- Lahart, I., & Robertson, P. (2009). Strength and conditioning programme design for combat sports. *Advances in Strength and Conditioning Research*, November, 189–216.
- Lubis, J. (2013). *Panduan Praktis Penyusunan Program Latihan*. PT Raja Grafindo Persada.
- MacDonald, C. J., Lamont, H. S., & Garner, J. C. (2012). A comparison of the effects of 6 weeks of traditional resistance training, plyometric training, and complex training on measures of strength and anthropometrics. *The Journal of Strength & Conditioning Research*, 26(2), 422–431.
- MacDougall, J.D, Wenger, H.A, Green, H. J. (1982). *Physiological Testing of the Elite Athlete*. New York: Movement Publications.
- MacKenzie, B. (2005). *101 Performance Evaluation Tests*. London : Electric Word plc.
- McArdle, W.D., Katch, F.I. & Katch, V. L. (1986). *Exercise Physiology : Energy, Nutrition, and Human Performance*.2nd. Ed. Lea & Febiger, Philadelphia.
- Meckel, Y., Gefen, Y., Nemet, D., & Eliakim, A. (2012). Influence of short vs. long repetition sprint training on selected fitness components in young soccer players. *The Journal of Strength & Conditioning Research*, 26(7), 1845–1851.
- Medbo, J. I., Mohn, A. C., Tabata, I., Bahr, R., Vaage, O., & Sejersted, O. M. (1988). Anaerobic capacity determined by maximal accumulated O₂ deficit. *Journal of Applied Physiology*. <https://doi.org/10.1152/jappl.1988.64.1.50>
- Mihai, C. (2011). Force – The Only Conditional Quality? Points of View on Certain Aspects of Theory of Sports Training. *International Journal of Wrestling Science*, 1(2), 79–85. <https://doi.org/10.1080/21615667.2011.10878937>
- Milanović, Z., Sporiš, G., & Weston, M. (2015). Effectiveness of high-intensity interval training (HIT) and continuous endurance training for VO_{2max} improvements: a systematic review and meta-analysis of controlled trials. *Sports Medicine*, 45(10), 1469–1481.
- Pate. (1984). *Dasar-Dasar Ilmiah Kepelatihan*. Saunders College Publishing, Philadelphia New York Chicago.

- Pate, R. R. (1991). Health-Related Measures of Children's Physical Fitness. *Journal of School Health.* <https://doi.org/10.1111/j.1746-1561.1991.tb06021.x>
- Rosenblat, M. A., Perrotta, A. S., & Thomas, S. G. (2020). Effect of High-Intensity Interval Training Versus Sprint Interval Training on Time-Trial Performance: A Systematic Review and Meta-analysis. *Sports Medicine*, 50(6), 1145–1161. <https://doi.org/10.1007/s40279-020-01264-1>
- Scott, J. R. (1998). Fox's Physiological Basis for Exercise and Sport, 6th Edition. *Medicine & Science in Sports & Exercise.* <https://doi.org/10.1097/00005768-199812000-00016>
- Sheykhlovand, M., Gharaat, M., Bishop, P., Khalili, E., Karami, E., & Fereshtian, S. (2015). Anthropometric, physiological, and performance characteristics of elite canoe polo players. *Psychology & Neuroscience*, 8(2), 257.
- Sindiani, M., Eliakim, A., Segev, D., & Meckel, Y. (2017). The effect of two different interval-training programmes on physiological and performance indices. *European Journal of Sport Science*, 17(7), 830–837. <https://doi.org/10.1080/17461391.2017.1321687>
- Sloth, M., Sloth, D., Overgaard, K., & Dalgas, U. (2013). Effects of sprint interval training on VO_{2max} and aerobic exercise performance: A systematic review and meta-analysis. *Scandinavian Journal of Medicine and Science in Sports*, 23(6), 341–352. <https://doi.org/10.1111/sms.12092>
- Sözen, H., & Akyıldız, C. (2018). The Effects of Aerobic and Anaerobic Training on Aerobic and Anaerobic Capacity. *International Journal of Anatolia Sport Sciences.* <https://doi.org/10.5505/jiasscience.2018.68077>
- Subekti, N., Syaukani, A. A., & Fatoni, M. (2019). Measurement of Anaerobic Capacity Based On Fatigue Index for Pencak Silat Athletes on Combat Category. *International Summit on Science Technology and Humanity*, 681–686.
- Sukadiyanto. (2011). *Pengantar Teori dan Metodologi Melatih Fisik.* Bandung: Lubuk Agung.
- Sumetry, R., Syafrudin, & Gusril. (2021). The efficacy of anaerobic capacity interval training on kick endurance of pencaksilat athletes. *Annals of Agri Bio Research*, 26(2), 209–213.
- Susanto, D. M., Maidarman, Suwirman, & Heru syrarli, L. (2020). Kondisi Fisik Atlet Pencak Silat. *Jurnal Patriot*, 2(2018), 692–704.
- Syaifullah, R., & Doewes, R. I. (2020). Pencak silat talent test development. *International Journal of Human Movement and Sports Sciences*, 8(6), 361–368. <https://doi.org/10.13189/saj.2020.080607>
- Terada, T., Toghi Eshghi, S. R., Liubaoerjijin, Y., Kennedy, M., Myette-Côté, E., Fletcher, K., & Boulé, N. G. (2019). Overnight fasting compromises exercise intensity and volume during sprint interval training but improves high-

- intensity aerobic endurance. *J. Sports Med. Phys. Fit*, 59, 357–365.
- University, O. (2020). *The Basics Of Physical Conditioning*. USA: Ohio University.
- Westra, H. G., De Haan, A., Van Doorn, J. E., & De Haan, E. J. (1985). The effect of intensive interval training on the anaerobic power of the rat quadriceps muscle. *Journal of Sports Sciences*, 3(2), 139–150. <https://doi.org/10.1080/02640418508729743>
- Wiguna, I. B. (2017). *Teori dan Aplikasi Latihan Kondisi Fisik*. Depok: Rajawali Pers.