

## DAFTAR PUSTAKA

- Ahmadizad, S., Avansar, A.S., Ebrahim, K., Avandi, M., & Ghasemikaram, M., 2015. The effects of short-term high-intensity interval training vs. moderate-intensity continuous training on plasma levels of nesfatin-1 and inflammatory markers. *Horm. Mol. Biol. Clin. Investig.* doi:10.1515/hmbci-2014-0038
- Airin, S., Linoby, A., Mohamad Zaki, M.S., Baki, H., Sariman, H., Esham, B., et al., 2014. The Effects of High-Intensity Interval Training and Continuous Training on Weight Loss and Body Composition in Overweight Females, in: *Proceedings of the International Colloquium on Sports Science, Exercise, Engineering and Technology 2014 (ICoSSEET 2014)*. Springer Singapore, pp. 401–409. doi:10.1007/978-981-287-107-7\_42
- Alahmadi, M.A., 2014. High-intensity Interval Training and Obesity. *J. Nov. Physiother.* 04. doi:10.4172/2165-7025.1000211
- American College of Sports Medicine, 2017. ACSM's guidelines for exercise testing and prescription, 10th ed. Wolters Kluwer, USA.
- Andreou, E., Philippou, C., & Papandreou, D., 2011. Effects of an Intervention and Maintenance Weight Loss Diet with and without Exercise on Anthropometric Indices in Overweight and Obese Healthy Women. *Ann. Nutr. Metab.* 59: 187–192. doi:http://dx.doi.org/10.1159/000334755
- Azzu, V., & Brand, M.D., 2010. The on-off switches of the mitochondrial uncoupling proteins. *Trends Biochem. Sci.* 35: 298–307. doi:10.1016/j.tibs.2009.11.001
- Baar, K., 2006. Training for endurance and strength: lessons from cell signaling. *Med. Sci. Sport. Exerc.* 38.
- Bagchi, D., & Preuss, H., 2013. Obesity: epidemiology, pathophysiology, and prevention, Second. ed. Taylor and Francis Group, Amerika.
- Baker, J., McCormick, M., & R.A Robergs, . 2010., 2010. Interaction among skeletal muscle metabolic energy systems during intense exercise. *J. Nutr. Metab.* 1–13.
- Batacan, R.B., Duncan, M.J., Dalbo, V.J., Tucker, P.S., & Fenning, A.S., 2017. Effects of high-intensity interval training on cardiometabolic health: a systematic review and meta-analysis of intervention studies. *Br. J. Sports Med.* 51: 494. doi:http://dx.doi.org/10.1136/bjsports-2015-095841
- Bohn, T., 2019. Carotenoids and Markers of Oxidative Stress in Human

Observational Studies and Intervention Trials: Implications for Chronic Diseases. *Antioxidants* (Basel, Switzerland) 8: 179. doi:10.3390/antiox8060179

Bond, B., Williams, C.A., Jackman, S.R., Woodward, A., Armstrong, N., & Barker, A.R., 2015. Accumulating exercise and postprandial health in adolescents. *Metab. - Clin. Exp.* 64: 1068–1076. doi:10.1016/j.metabol.2015.05.016

Boutcher, S.H., 2011. High-intensity intermittent exercise and fat loss. *J. Obes.* 2011: 868305. doi:10.1155/2011/868305

Bray, G.A., Frühbeck, G., Ryan, D.H., & Wilding, J.P., 2016. Management of obesity. *Lancet* 387: 1947–56. doi:[http://dx.doi.org/10.1016/S0140-6736\(16\)00271-3](http://dx.doi.org/10.1016/S0140-6736(16)00271-3)

Bray, T.J., Chouhan, M.D., Punwani, S., Bainbridge, A., & Hall-Craggs, M.A., 2018. Fat fraction mapping using magnetic resonance imaging: insight into pathophysiology. *Br J Radiol* 90: 20170344. doi:<https://doi.org/10.1259/bjr.20170344>

Brondani, Assmann, T.S., De Souza, B.M., Bouças, A.P., Canani, L.H., & Crispim, D., 2014a. Meta-analysis reveals the association of common variants in the Uncoupling Protein (UCP) 1-3 genes with body mass index variability. *PLoS One* 9. doi:10.1371/journal.pone.0096411

Brondani, Canani, Souza, B.M. de, Assmann, T.S., Bouças, A.P., Bauer, A.C., et al., 2014b. Association of the UCP polymorphisms with susceptibility to obesity: case–control study and meta-analysis. *Mol. Biol. Rep.* 41: 5053–5067.

Burgomaster, K.A., Heigenhauser, G.J.F., & Gibala, M.J., 2006. Effect of short-term sprint interval training on human skeletal muscle carbohydrate metabolism during exercise and time-trial performance. *J. Appl. Physiol.* 100: 2041–2047. doi:10.1152/jappphysiol.01220.2005

Busiello, R.A., Savarese, S., & Lombardi, A., 2015. Mitochondrial uncoupling proteins and energy metabolism. *Front. Physiol.* 6: 36. doi:10.3389/fphys.2015.00036

Centre for Public Health Excellence at NICE, 2006. Obesity: the prevention, identification, assessment and management of overweight and obesity in adults and children. National Institute for Health and Clinical Excellence (UK), London.

Chaput, J.P., Tremblay, A., Pereira, B., Boirie, Y., Duclos, M., & Thivel, D., 2016. Food intake response to exercise and active video gaming in adolescents: effect of weight status. *Br. J. Nutr.* 115: 547–553. doi:<http://dx.doi.org/10.1017/S0007114515004602>

Clement, K., Garner, C., Harger, J., Philippi, LeDuc, C., Carcy, et al., 1996.

Indication for linkage of the human ob gene region with extreme obesity. *Diabetes* 45: :687-690.

Coffey, V., & Hawley, J.A., 2007. The molecular bases of training adaptation. *Sport. Med.* 37: 767–773.

Combes, A., Dekerle, J., Webborn, N., Watt, P., Bougault, V., & Daussin, F.N., 2015. Exercise-induced metabolic fluctuations influence AMPK, p38-MAPK and CaMKII phosphorylation in human skeletal muscle. *Physiol. Rep.* 3: e12462. doi:10.14814/phy2.12462

Comuzzie, A.G., 2003. The genetics of obesity in mexican americans: the evidence from genome scanning efforts in the San Antonio Family Heart Study. *Hum. Biol.* 75(5): 635–646.

Costford, S., Gowing, A., & Harper, M.-E., 2007. Mitochondrial uncoupling as a target in the treatment of obesity. *Curr. Opin. Clin. Nutr. Metab. Care* 10.

Dalgaard, L.T., 2011. Genetic variance in uncoupling protein 2 in relation to obesity, type 2 diabetes, and related metabolic traits: Focus on the functional -866G>A promoter variant (rs659366). *J. Obes.* doi:10.1155/2011/340241

Dalleck, L.C., & Tischendorf, J.S., 2012. Guidelines for exercise testing and prescription (ACSM), in: Encyclopedia of Lifestyle Medicine & Health. Lippincott Williams & Wilkins, Philadelphia. doi:10.4135/9781412994149.n165

De Feo, P., 2013. Is high-intensity exercise better than moderate-intensity exercise for weight loss? *Nutr. Metab. Cardiovasc. Dis.* 23: 1037–1042. doi:10.1016/j.numecd.2013.06.002

de Mello, A.H., Costa, A.B., Engel, J.D.G., & Rezin, G.T., 2018. Mitochondrial dysfunction in obesity. *Life Sci.* 192: 26–32. doi:<https://doi.org/10.1016/j.lfs.2017.11.019>

De Nardi, A.T., Tolves, T., Lenzi, T.L., Signori, L.U., & Silva, A.M.V. da, 2018. High-intensity interval training versus continuous training on physiological and metabolic variables in prediabetes and type 2 diabetes: A meta-analysis. *Diabetes Res. Clin. Pract.* doi:10.1016/j.diabres.2017.12.017

de Souza, B.M., Brondani, L.A., Bouças, A.P., Sortica, D.A., Kramer, C.K., Canani, L.H., et al., 2013. Associations between UCP1 -3826A/G, UCP2 -866G/A, Ala55Val and Ins/Del, and UCP3 -55C/T Polymorphisms and Susceptibility to Type 2 Diabetes Mellitus: Case-Control Study and Meta-Analysis. *PLoS One* 8. doi:10.1371/journal.pone.0054259

de Souza, J.F.T., Dáttilo, M., de Mello, M.T., Tufik, S., Antunes, H.K.M., Palareti, G., et al., 2017. High-intensity interval training attenuates insulin resistance induced by sleep deprivation in healthy males. *Int. J. Lab. Hematol.* 38: 42–

49. doi:10.3389/fphys.2017.00992

Di Donato, D.M., West, D.W.D., Churchward-Venne, T.A., Breen, L., Baker, S.K., & Phillips, S.M., 2014. Influence of aerobic exercise intensity on myofibrillar and mitochondrial protein synthesis in young men during early and late postexercise recovery. *Am. J. Physiol. Metab.* 306: E1025–E1032. doi:10.1152/ajpendo.00487.2013

Divakaruni, A.S., & Brand, M.D., 2011. The regulation and physiology of mitochondrial proton leak. *Physiology* 26: 192–205. doi:10.1152/physiol.00046.2010

Dulloo, A.G., Jacquet, J., Solinas, G., Montani, J.-P., & Schutz, Y., 2010. Body composition phenotypes in pathways to obesity and the metabolic syndrome. *Int. J. Obes.* 34: S4–S17. doi:10.1038/ijo.2010.234

Dulloo, A.G., & Montani, J.P., 2015. Pathways from dieting to weight regain, to obesity and to the metabolic syndrome: An overview. *Obes. Rev.* 16: 1–6. doi:10.1111/obr.12250

Dupuit, M., Rance, M., Morel, C., Bouillon, P., Pereira, B., Bonnet, A., et al., 2020. Moderate-Intensity Continuous Training or High-Intensity Interval Training with or without Resistance Training for Altering Body Composition in Postmenopausal Women. *Med. Sci. Sports Exerc.* 52: 736–745. doi:10.1249/MSS.0000000000002162

Egan, B., Carson, B.P., Garcia-Roves, P.M., Chibalin, A. V, Sarsfield, F.M., Barron, N., et al., 2010. Exercise intensity-dependent regulation of peroxisome proliferator-activated receptor  $\gamma$  coactivator-1 $\alpha$  mRNA abundance is associated with differential activation of upstream signalling kinases in human skeletal muscle. *J. Physiol.* 588: 1779–1790. doi:10.1113/jphysiol.2010.188011

Egan, B., & Zierath, J.R., 2013. Exercise metabolism and the molecular regulation of skeletal muscle adaptation. *Cell Metab.* 17: 162–184. doi:10.1016/j.cmet.2012.12.012

Elia, M., 2013. Body composition by whole-body bioelectrical impedance and prediction of clinically relevant outcomes: overvalued or underused? *Eur. J. Clin. Nutr.* 67: S60-70. doi:http://dx.doi.org/10.1038/ejcn.2012.166

Ellulu, M.S., Patimah, I., Khaza'ai, H., Rahmat, A., & Abed, Y., 2017. Obesity and inflammation: the linking mechanism and the complications. *Arch. Med. Sci.* 13: 851–863. doi:10.5114/aoms.2016.58928

Esterbauer, H., Schneitler, C., Oberkofler, H., Ebenbichler, C., Paulweber, B., Sandhofer, F., et al., 2001. A common polymorphism in the promoter of UCP2 is associated with decreased risk of obesity in middle-aged humans. *Nat. Genet.* 28: 178–183. doi:10.1038/88911

- Farooqi, I.S., Jebb, S.A., Langmack, G., Lawrence, E., Cheetham, C.H., Prentice, A.M., et al., 1999. Effects of recombinant leptin therapy in a child with congenital leptin deficiency. *N. Engl. J. Med.* 341: 879–884. doi:10.1056/NEJM199909163411204
- Fernández-Sánchez, A., Madrigal-Santillán, E., Bautista, M., Esquivel-Soto, J., Morales-González, A., Esquivel-Chirino, C., et al., 2011. Inflammation, oxidative stress, and obesity. *Int. J. Mol. Sci.* 12: 3117–3132. doi:10.3390/ijms12053117
- Fruh, S.M., 2017. Obesity: Risk factors, complications, and strategies for sustainable long-term weight management. *J. Am. Assoc. Nurse Pract.* 29: S3–S14. doi:10.1002/2327-6924.12510
- Fu, Q., & Levine, B.D., 2013. Chapter 13 - Exercise and the autonomic nervous system, in: Buijs, R.M., & Swaab, D.F.B.T.-H. of C.N. (Eds.), *Autonomic Nervous System*. Elsevier, pp. 147–160. doi:<https://doi.org/10.1016/B978-0-444-53491-0.00013-4>
- Fuentes, E., Fuentes, F., Vilahur, G., Badimon, L., & Palomo, I., 2013. Mechanisms of chronic state of inflammation as mediators that link obese adipose tissue and metabolic syndrome. *Mediators Inflamm.* 2013. doi:10.1155/2013/136584
- Gamboa, R., Huesca-Gómez, C., López-Pérez, V., Posadas-Sánchez, R., Cardoso-Saldaña, G., Medina-Urrutia, A., et al., 2018. The UCP2 -866G/A, Ala55Val and UCP3 -55C/T polymorphisms are associated with premature coronary artery disease and cardiovascular risk factors in Mexican population . *Genet. Mol. Biol.* .
- Ganong, W., 2012. Buku ajar fisiologi kedokteran, 20th ed. EGC, Jakarta.
- García-Sánchez, A., Miranda-Díaz, A.G., & Cardona-Muñoz, E.G., 2020. The Role of Oxidative Stress in Physiopathology and Pharmacological Treatment with Pro- And Antioxidant Properties in Chronic Diseases. *Oxid. Med. Cell. Longev.* 2020. doi:10.1155/2020/2082145
- Gerosa-Neto, J., Antunes, B.M.M., Campos, E.Z., Rodrigues, J., Ferrari, G.D., Neto, J.C.R., et al., 2016. Impact of long-term high-intensity interval and moderate-intensity continuous training on subclinical inflammation in overweight/obese adults. *J. Exerc. Rehabil.* 12: 575–580. doi:10.12965/jer.1632770.385
- 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. *J. Physiol.* 590: 1077–1084. doi:10.1113/jphysiol.2011.224725
- Gibala, M.J., Little, J.P., van Essen, M., Wilkin, G.P., Burgomaster, K.A., Safdar, A., et al., 2006. Short-term sprint interval versus traditional endurance training: similar initial adaptations in human skeletal muscle and exercise

- performance. *J. Physiol.* 575: 901–911. doi:10.1113/jphysiol.2006.112094
- Gibala, M.J., & McGee, S.L., 2008. Metabolic adaptations to short-term high-intensity interval training: a little pain for a lot of gain? *Exerc. Sport Sci. Rev.* 36.
- Gibala, M.J., McGee, S.L., Garnham, A.P., Howlett, K.F., Snow, R.J., & Hargreaves, M., 2009. Brief intense interval exercise activates AMPK and p38 MAPK signaling and increases the expression of PGC-1 $\alpha$  in human skeletal muscle. *J. Appl. Physiol.* 106: 929–934. doi:10.1152/jappphysiol.90880.2008
- Gillen, J.B., & Gibala, M.J., 2013. Is high-intensity interval training a time-efficient exercise strategy to improve health and fitness? *Appl. Physiol. Nutr. Metab.* 39: 409–412. doi:10.1139/apnm-2013-0187
- Goedecke, J.H., & Micklesfield, L.K., 2014. The effect of exercise on obesity, body fat distribution and risk for type 2 diabetes, in: *Medicine and Sport Science*. pp. 82–93. doi:10.1159/000357338
- Greenway, F.L., 2015. Physiological adaptations to weight loss and factors favouring weight regain. *Int. J. Obes.* 39: 1188–1196. doi:10.1038/ijo.2015.59
- Hashemi, M., Rezaei, H., Kaykhaei, M.-A., & Taheri, M., 2014. A 45-bp insertion/deletion polymorphism of UCP2 gene is associated with metabolic syndrome. *J. Diabetes Metab. Disord.* 13: 12. doi:10.1186/2251-6581-13-12
- Hassan, N.E., El-Masry, S.A., Zarouk, W., El Banna, R.A., Mosaad, R.M., Al-Tohamy, M., et al., 2018. Obesity phenotype in relation to gene polymorphism among samples of Egyptian children and their mothers. *Genes Dis.* 5: 150–157. doi:10.1016/j.gendis.2017.12.004
- Hawley, J.A., Hargreaves, M., Joyner, M.J., & Zierath, J.R., 2014. Integrative biology of exercise. *Cell* 159: 738–749. doi:10.1016/j.cell.2014.10.029
- Hendarto, A., Sastroasmoro, S., & Sjarif, D.R., 2019. Association between low-grade chronic inflammation with adipocytokines and body fat mass in superobese male children. *Paediatr. Indones.* 59: 13–17.
- Henderson, G.C., Fattor, J.A., Horning, M.A., Faghihnia, N., Johnson, M.L., Mau, T.L., et al., 2007. Lipolysis and fatty acid metabolism in men and women during the postexercise recovery period. *J. Physiol.* 584: 963–981. doi:10.1113/jphysiol.2007.137331
- Henke, E., Oliveira, V.S., Schipper, L., da Silva, I.M., Dorneles, G., Elsner, V.R., et al., 2018. Acute and chronic effects of High Intensity Interval Training on inflammatory and oxidative stress markers of postmenopausal obese women. *Wiley*. doi:10.1002/tsm2.43
- Hinton, B.J., Fan, B., Ng, B.K., & Shepherd, J.A., 2017. Dual energy X-ray



absorptiometry body composition reference values of limbs and trunk from NHANES 1999-2004 with additional visualization methods. *PLoS One* 12: e0174180–e0174180. doi:10.1371/journal.pone.0174180

Hoier, B., Passos, M., Bangsbo, J., & Hellsten, Y., 2013. Intense intermittent exercise provides weak stimulus for vascular endothelial growth factor secretion and capillary growth in skeletal muscle. *Exp. Physiol.* 98: 585–597. doi:10.1113/expphysiol.2012.067967

Holloszy, J., & Coyle, E., 1984. Adaptations of skeletal muscle to endurance exercise and their metabolic consequences. *J appl Physiol Respi Env. Exerc Physiol* 56(4): 831–8. doi:10.1152/jappl.1984.56.4.831

Hottenrott, K., Ludyga, S., & Schulze, S., 2012. Effects of high intensity training and continuous endurance training on aerobic capacity and body composition in recreationally active runners, ©Journal of Sports Science and Medicine.

Hruby, Adela and Hu, F.B., 2016. The epidemiology of obesity: a big picture. *Pharmacoeconomics* 33(7): 673–689.

Huang, C.-J., McAllister, M.J., Slusher, A.L., Webb, H.E., Mock, J.T., & Acevedo, E.O., 2015. Obesity-related oxidative stress: the impact of physical activity and diet manipulation. *Sport. Med. - Open* 1: 32. doi:10.1186/s40798-015-0031-y

Hughes, I.L., & Higgins, T., 2019. Six Weeks High Intensity Interval Training (HIIT) Improves a Variety of Different Diabetes Mellitus Type 2 Risk Markers. *Int. J. Phys. Med. Rehabil.* 7: 1–10. doi:10.4172/2329-9096.1000503

Huriyati, E., Luglio, H.F., Ratrikaningtyas, P.D., Tsani, A.F.A., Sadewa, A.H., & Juffrie, M., 2016. Dyslipidemia, insulin resistance and dietary fat intake in obese and normal weight adolescents: The role of uncoupling protein 2 - 866G/A gene polymorphism. *Int. J. Mol. Epidemiol. Genet.* 7: 67–73.

Indra, M., 2006. Dasar genetika obesitas visceral. *J. Kedokt. Brawijaya* 22: 10–17. doi:10.21776/ub.jkb.2006.022.01.3

Jacobs, R.A., Flück, D., Bonne, T.C., Bürgi, S., Christensen, P.M., Toigo, M., et al., 2013. Improvements in exercise performance with high-intensity interval training coincide with an increase in skeletal muscle mitochondrial content and function. *J. Appl. Physiol.* 115: 785–793. doi:10.1152/japplphysiol.00445.2013

Jakicic, J.M., Rogers, R.J., Davis, K.K., & Collins, K.A., 2018. Role of physical activity and exercise in treating patients with overweight and obesity. *Clin. Chem.* 64: 99–107. doi:10.1373/clinchem.2017.272443

Janssen, I., & LeBlanc, A.G., 2010. Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *Int. J. Behav.*

*Nutr. Phys. Act.* 7: 40. doi:<http://dx.doi.org/10.1186/1479-5868-7-40>

Jarvandi, S., Davidson, N.O., Jeffe, D.B., & Schootman, M., 2012. Influence of Lifestyle Factors on Inflammation in Men and Women with Type 2 Diabetes: Results from the National Health and Nutrition Examination Survey, 1999-2004. *Ann. Behav. Med.* 44: 399-407. doi:<http://dx.doi.org/10.1007/s12160-012-9397-y>

Joyner, M.J., & Coyle, E.F., 2008. Endurance exercise performance: the physiology of champions. *J. Physiol.* 586: 35-44. doi:10.1113/jphysiol.2007.143834

Jung, W.-S., Hwang, H., Kim, J., Park, H.-Y., & Lim, K., 2019. Comparison of excess post-exercise oxygen consumption of different exercises in normal weight obesity women. *J. Exerc. Nutr. Biochem.* 23: 22-27. doi:10.20463/jenb.2019.0013

Karstoft, K., Wallis, G.A., Pedersen, B.K., & Solomon, T.P.J., 2016. The effects of interval- vs. continuous exercise on excess post-exercise oxygen consumption and substrate oxidation rates in subjects with type 2 diabetes. *Metabolism* 65: 1316-1325. doi:<https://doi.org/10.1016/j.metabol.2016.05.017>

Kaspar, F., Jelinek, H.F., Perkins, S., Al-Aubaidy, H.A., DeJong, B., & Butkowski, E., 2016. Acute-phase inflammatory response to single-bout HIIT and endurance training: a comparative study. *Mediators Inflamm.* 2016: 5474837. doi:10.1155/2016/5474837

Kemendes RI, 2018. Hasil Utama RISKESDAS 2018. Kementerian Kesehatan Republik Indonesia, Jakarta.

Khammassi, M., Ouerghi, N., Hadj-Taieb, S., Feki, M., Thivel, D., & Bouassida, A., 2018. Impact of a 12-week high-intensity interval training without caloric restriction on body composition and lipid profile in sedentary healthy overweight/obese youth. *J Exerc Rehabil* 14: 118-125. doi:10.12965/jer.1835124.562

Kong, J.P., Jok, L., Ayub, A. Bin, & Bau, R.A., 2017. Worksite weight management program. *Nutr. Food Sci.* 47: 490-510.

Kong, Z., Fan, X., Sun, S., Song, L., Shi, Q., & Nie, J., 2016. Comparison of high-intensity interval training and moderate-to-vigorous continuous training for cardiometabolic health and exercise enjoyment in obese young women: a randomized controlled trial. *PLoS One* 11: e0158589-e0158589. doi:10.1371/journal.pone.0158589

Kristensen, D.E., Albers, P.H., Prats, C., Baba, O., Birk, J.B., & Wojtaszewski, J.F.P., 2015. Human muscle fibre type-specific regulation of AMPK and downstream targets by exercise. *J. Physiol.* 593: 2053-2069. doi:10.1113/jphysiol.2014.283267



- Kuriyan, R., 2018. Body composition technique. *Indian J. Med. Res.*
- Labayen, I., Ortega, F.B., Sjöström, M., Sjöström, S., Sjöström, S., Torbjörn, T., et al., 2009. Association of Common Variants of UCP2 Gene With Low-Grade Inflammation in Swedish Children and Adolescents; The European Youth Heart Study, *Pediatr Res.*
- Lapice, E., Pinelli, M., Pisu, E., Monticelli, A., Gambino, R., Pagano, G., et al., 2010. Uncoupling protein 2 G(-866)A polymorphism: A new gene polymorphism associated with C-reactive protein in type 2 diabetic patients C-reactive protein in type 2 diabetic patients. *Cardiovasc. Diabetol.* 9. doi:10.1186/1475-2840-9-68
- Larsen, I., Welde, B., Martins, C., & Tjønnå, A.E., 2014. High- and moderate-intensity aerobic exercise and excess post-exercise oxygen consumption in men with metabolic syndrome. *Scand. J. Med. Sci. Sports* 24: e174–e179. doi:10.1111/sms.12132
- Latini, A., Scussiato, K., Rosa, R.B., Llesuy, S., Belló-Klein, A., Dutra-Filho, C.S., et al., 2003. D-2-hydroxyglutaric acid induces oxidative stress in cerebral cortex of young rats. *Eur. J. Neurosci.* 17: 2017–2022. doi:10.1046/j.1460-9568.2003.02639.x
- Levitt, D.G., Heymsfield, S.B., Pierson, R.N., Shapses, S.A., & Kral, J.G., 2007. Physiological models of body composition and human obesity. *Nutr. Metab.* 4: 1–14. doi:10.1186/1743-7075-4-19
- Lidegaard, L.P., Schwennesen, N., Willaing, I., & Færch, K., 2016. Barriers to and motivators for physical activity among people with Type 2 diabetes: patients' perspectives. *Diabet. Med.* 33: 1677–1685. doi:10.1111/dme.13167
- Lieberman, M., & Marks, A., 2009. Mark's basic medical biochemistry : a clinical approach. Wolter Kluwer / Lippincot Williams & Wilkins, Philadelphia.
- Little, J.P., & Francois, M.E., 2014. High-Intensity Interval Training for Improving Postprandial Hyperglycemia. *Res. Q. Exerc. Sport* 85: 451–456. doi:http://dx.doi.org/10.1080/02701367.2014.963474
- Little, J.P., Safdar, A., Bishop, D., Tarnopolsky, M.A., & Gibala, M.J., 2011. An acute bout of high-intensity interval training increases the nuclear abundance of PGC-1α and activates mitochondrial biogenesis in human skeletal muscle. *Am. J. Physiol. Integr. Comp. Physiol.* 300: R1303–R1310. doi:10.1152/ajpregu.00538.2010
- Liubaoerjijin, Y., Terada, T., Fletcher, K., & Boulé, N.G., 2016. Effect of aerobic exercise intensity on glycemic control in type 2 diabetes: a meta-analysis of head-to-head randomized trials. *Acta Diabetol.* 53: 769–781. doi:http://dx.doi.org/10.1007/s00592-016-0870-0

Lucas, A.R., Klepin, H.D., Porges, S.W., & Rejeski, W.J., 2018. Mindfulness-based movement: a polyvagal perspective. *Integr. Cancer Ther.* 17: 5–15. doi:10.1177/1534735416682087

MacInnis, M.J., & Gibala, M.J., 2017. Physiological adaptations to interval training and the role of exercise intensity. *J. Physiol.* 595: 2915–2930. doi:10.1113/JP273196

MacInnis, M.J., Zacharewicz, E., Martin, B.J., Haikalis, M.E., Skelly, L.E., Tarnopolsky, M.A., et al., 2017. Superior mitochondrial adaptations in human skeletal muscle after interval compared to continuous single-leg cycling matched for total work. *J. Physiol.* 595: 2955–2968. doi:10.1113/JP272570

Magnon, V., Dutheil, F., & Auxiette, C., 2018. Sedentariness: A need for a definition. *Front. Public Heal.* 6: 55–58. doi:10.3389/fpubh.2018.00372

Martin-Smith, R., Cox, A., Buchan, D.S., Baker, J.S., Grace, F., & Sculthorpe, N., 2020. High intensity interval training (HIIT) improves cardiorespiratory fitness (CRF) in healthy, overweight and obese adolescents: A systematic review and meta-analysis of controlled studies. *Int. J. Environ. Res. Public Health.* doi:10.3390/ijerph17082955

Martinez-Hervas, S., Mansego, M.L., de Marco, G., Martinez, F., Alonso, M.P., Morcillo, S., et al., 2012. Polymorphisms of the UCP2 gene are associated with body fat distribution and risk of abdominal obesity in Spanish population. *Eur. J. Clin. Invest.* 42: 171–178. doi:10.1111/j.1365-2362.2011.02570.x

Martini, F., Nath, J., Bartholomew, E., Ober, W., Garrison, C., & Welch, K., 2009. Fundamentals of anatomy and physiology, 8th ed. Pearson Education, Inc, USA.

Meiliana, A., Dewi, N.M., & Wijaya, A., 2016. Personalized Medicine: The Future of Health Care. *Indones. Biomed. J.* 8: 127. doi:10.18585/inabj.v8i3.271

Miguet, M., Beaulieu, K., Fillon, A., Khammassi, M., Masurier, J., Lambert, C., et al., 2020. Effect of a 10-month residential multidisciplinary weight loss intervention on food reward in adolescents with obesity. *Physiol. Behav.* 223: 112996. doi:10.1016/J.PHYSBEH.2020.112996

Moniz, S.C., Islam, H., & Hazell, T.J., 2020. Mechanistic and methodological perspectives on the impact of intense interval training on post-exercise metabolism. *Scand. J. Med. Sci. Sport.* 30: 638–651. doi:10.1111/sms.13610

NHS Quality Improvement Scotland, 2010. Management of obesity. A national clinical guideline. Scottish Intercollegiate Guidelines Network (SIGN), Edinburgh (Scotland).

Ofei, F., 2005. Obesity - a preventable disease. *Ghana Med. J.* 39: 98–101.

- Oguzkan- Balci, S., Nilgun, C.-A., Muradiye, N., Mustafa, A., Halime, S., Ayse, B., et al., 2013. Mitochondrial uncoupling protein 2 (UCP2) gene polymorphisms are associated with childhood obesity and related metabolic disorders. *J. Pediatr. Endocrinol. Metab.* doi:10.1515/jpem-2012-0267
- Oktavianthi, S., Trimarsanto, H., Febinia, C.A., Suastika, K., Saraswati, M.R., Dwipayana, P., et al., 2012. Uncoupling protein 2 gene polymorphisms are associated with obesity. *Cardiovasc. Diabetol.* 11: 1–10. doi:10.1186/1475-2840-11-41
- Ouchi, N., Ohashi, K., Shibata, R., Murohara, T., Giammanco, M.M., Marini, H.R., et al., 2020. Adipocytokines and obesity-linked disorders. *J. Biol. Res.* 15: 145–157. doi:10.1016/j.hgmx.2016.06.011
- Ouerghi, N., Ben Fradj, M.K., Bezrati, I., Khammassi, M., Feki, M., Kaabachi, N., et al., 2017. Effects of high-intensity interval training on body composition, aerobic and anaerobic performance and plasma lipids in overweight/obese and normal-weight young men. *Biol. Sport* 34: 385–392. doi:10.5114/biolSport.2017.69827
- Park, J.H., Moon, J.H., Kim, H.J., Kong, M.H., & Oh, Y.H., 2020. Sedentary Lifestyle: Overview of Updated Evidence of Potential Health Risks. *Korean J. Fam. Med.* 41: 365–373. doi:10.4082/KJFM.20.0165
- Permatasari, D., Purnawati, S., Satriyasa, B.K., Made, L., Sri, I., & Adiputra, H., 2017. Pelatihan Interval Intensitas Tinggi Lebih Efektif Menurunkan Persentase Lemak Tubuh Dibandingkan Pelatihan Kontinyu Submaksimal Pada Siswa Sman 4 5: 10–20.
- Petridou, A., Siopi, A., & Mougios, V., 2019. Exercise in the management of obesity. *Metabolism.* doi:10.1016/j.metabol.2018.10.009
- Poblete Aro, C.E., Russell Guzmán, J.A., Soto Muñoz, M.E., & Villegas González, B.E., 2015. Effects of high intensity interval training versus moderate intensity continuous training on the reduction of oxidative stress in type 2 diabetic adult patients: CAT. *Medwave* 15: e6212. doi:10.5867/medwave.2015.07.6212
- Primastuti, Wih, & Mun'im, 2013. Effect of a combination of extract of centella asiatica L. leaves and extract of green coffee (coffea canephora robusta P.) beans in a cream preparation for grade 1-3 cellulite and slimming. *Makara J. Sci.* 17(1): 1–5.
- Purnell, J.Q., Feingold, K.R., Anawalt, B., Alison Boyce, Chrousos, G., Herder, W.W. de, et al., 2018. Definitions, Classification, and Epidemiology of Obesity. In: Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.
- Qian, L., Xu, K., Xu, X., Gu, R., Liu, X., Shan, S., et al., 2013. UCP2 -866G/A, Ala55Val and UCP3 -55C/T Polymorphisms in Association with Obesity Susceptibility - A Meta-Analysis Study. *PLoS One* 8.

doi:10.1371/journal.pone.0058939

- Racil, G., Zouhal, H., Elmontassar, W., Abderrahmane, A. Ben, De Sousa, M.V., Chamari, K., et al., 2015. Plyometric exercise combined with high-intensity interval training improves metabolic abnormalities in young obese females more so than interval training alone. *Appl. Physiol. Nutr. Metab.* 41: 103–109. doi:10.1139/apnm-2015-0384
- Radak, Z., Chung, H.Y., & Goto, S., 2008. Systemic adaptation to oxidative challenge induced by regular exercise. *Free Radic. Biol. Med.* 44: 153–159. doi:10.1016/j.freeradbiomed.2007.01.029
- Ricquier, D., & Bouillaud, F., 2000. The uncoupling protein homologues: UCP1, UCP2, UCP3, StUCP and AtUCP. *Biochem. J.* 345 Pt 2: 161–179.
- Rogge, M.M., & Gautam, B., 2017. Biology of obesity and weight regain: Implications for clinical practice. *J. Am. Assoc. Nurse Pract.* 29: S15–S29. doi:10.1002/2327-6924.12504
- Rose, A.J., & Hargreaves, M., 2003. Exercise increases Ca<sup>2+</sup>–calmodulin-dependent protein kinase II activity in human skeletal muscle. *J. Physiol.* 553: 303–309. doi:10.1113/jphysiol.2003.054171
- Rose, A.J., Kiens, B., & Richter, E.A., 2006. Ca<sup>2+</sup>–calmodulin-dependent protein kinase expression and signalling in skeletal muscle during exercise. *J. Physiol.* 574: 889–903. doi:10.1113/jphysiol.2006.111757
- Russell, A.P., Feilchenfeldt, J., Schreiber, S., Praz, M., & al, et, 2003. Endurance training in humans leads to fiber type-specific increases in levels of peroxisome proliferator-activated receptor-[gamma] coactivator-1 and peroxisome proliferator-activated receptor-[alpha] in skeletal muscle. *Diabetes* 52: 2874–2881.
- Sahl, R.E., Andersen, P.R., Gronbaek, K., Morville, T.H., Rosenkilde, M., Rasmussen, H.K., et al., 2017. Repeated Excessive Exercise Attenuates the Anti-Inflammatory Effects of Exercise in Older Men . *Front. Physiol.* .
- Sallam, N., & Laher, I., 2016. Exercise Modulates Oxidative Stress and Inflammation in Aging and Cardiovascular Diseases. *Oxid. Med. Cell. Longev.* 2016. doi:<http://dx.doi.org/10.1155/2016/7239639>
- Salopuro, T., Pulkkinen, L., Lindström, J., Kolehmainen, M., Tolppanen, A.-M., Eriksson, J.G., et al., 2009. Variation in the UCP2 and UCP3 genes associates with abdominal obesity and serum lipids: The Finnish Diabetes Prevention Study. *BMC Med. Genet.* 10: 94. doi:10.1186/1471-2350-10-94
- Santos, M.A. dos, Matzenbacher, F., Albarello, J.C. dos S., & Halmenschlager, G.H., 2019. Comparison of epoc and recovery energy expenditure between hiit and continuous aerobic exercise training. *Rev. Bras. Med. do Esporte* 25: 20–

23. doi:10.1590/1517-869220192501181346

Sarwer, D.B., & Polonsky, H.M., 2016. The psychosocial burden of obesity. *Endocrinol. Metab. Clin. North Am.* 45: 677–688. doi:10.1016/j.ecl.2016.04.016

Sastroasmoro, Sudigdo; Ismael, S., 2014. Dasar-dasar metodologi penelitian klinis, 5th ed. Sagung Seto, Jakarta.

Sawyer, B.J., Tucker, W.J., Bhammar, D.M., Ryder, J.R., Sweazea, K.L., & Gaesser, G.A., 2016. Effects of high-intensity interval training and moderate-intensity continuous training on endothelial function and cardiometabolic risk markers in obese adults. *J. Appl. Physiol.* 121: 279–288. doi:10.1152/jappphysiol.00024.2016

Sayar, N., Terzi, S., Yilmaz, H.Y., Tangurek, B., Bilsel, T., Cakmak, N., et al., 2007. Exercise-induced increase in lipid peroxidation in patients with chronic heart failure: relation to exercise intolerance. *Cardiology* 108: 307–313. doi:10.1159/000099100

Scagliusi, F.B., Polacow, V.O., Artioli, G.G., Benatti, F.B., & Lancha Jr, A.H., 2003. Selective underreporting of energy intake in women: Magnitude, determinants, and effect of training. *Am. Diet. Assoc. J. Am. Diet. Assoc.* 103: 1306–1313.

Shen, H., Qi, L., Shyong Tai, E., Chew, S.K., Tan, C.E., & Ordovas, J.M., 2006. Uncoupling protein 2 promoter polymorphism -866G/A, central adiposity, and metabolic syndrome in Asians. *Obesity* 14: 656–661. doi:10.1038/oby.2006.74

Sherwood, L., 2013. Human physiology : from cells to systems. Brooks/Cole.

Sherwood, N.E., & Jeffery, R.W., 2000. The Behavioral Determinants of Exercise: Implications for Physical Activity Interventions. *Annu. Rev. Nutr.* 20: 21–44. doi:10.1146/annurev.nutr.20.1.21

Simpson, K.A., & Singh, M.A.F., 2008. Effects of Exercise on Adiponectin: A Systematic Review. *Obesity* 16: 241–256. doi:10.1038/oby.2007.53

Skelly, L.E., Andrews, P.C., Gillen, J.B., Martin, B.J., Percival, M.E., & Gibala, M.J., 2014. High-intensity interval exercise induces 24-h energy expenditure similar to traditional endurance exercise despite reduced time commitment. *Appl. Physiol. Nutr. Metab.* Vol. 39: 845–848. doi:https://doi.org/10.1139/apnm-2013-0562

Smith-Ryan, A.E., Trexler, E.T., Wingfield, H.L., & Blue, M.N.M., 2016. Effects of high-intensity interval training on cardiometabolic risk factors in overweight/obese women. *J. Sports Sci.* 34: 2038–2046. doi:10.1080/02640414.2016.1149609



- Snyder, E.E., Walts, B., Pérusse, L., Chagnon, Y.C., Weisnagel, S.J., Rankinen, T., et al., 2004. The human obesity gene map: the 2003 update. *Obes. Res.* 12: 369–439. doi:10.1038/oby.2004.47
- Souza, B.M. de, Assmann, T.S., Kliemann, L.M., Gross, J.L., Canani, L.H., & Crispim, D., 2011. The role of uncoupling protein 2 (UCP2) on the development of type 2 diabetes mellitus and its chronic complications . *Arq. Bras. Endocrinol. Metabol.* .
- Srivastava, N., Prakash, J., Lakhan, R., Agarwal, C.G., Pant, D.C., & Mittal, B., 2010. A common polymorphism in the promoter of UCP2 is associated with obesity and hyperinsulenemia in northern Indians. *Mol. Cell. Biochem.* 337: 293–298. doi:10.1007/s11010-009-0311-2
- Su, L.Q., Fu, J.M., Sun, S.L., Zhao, G.G., Cheng, W., Dou, C.C., et al., 2019. Effects of HIIT and MICT on cardiovascular risk factors in adults with overweight and/or obesity: A meta-analysis. *PLoS One* 14. doi:10.1371/journal.pone.0210644
- Su, M., Chen, X., Chen, Y., Wang, C., Li, S., Ying, X., et al., 2018. UCP2 and UCP3 variants and gene-environment interaction associated with prediabetes and T2DM in a rural population: A case control study in China. *BMC Med. Genet.* 19: 1–9. doi:10.1186/s12881-018-0554-4
- Sudarsono, N.C., Tulaar, A.B., Jusman, S.W.A., Soewondo, P., Mon, Sudaryo, D.K., et al., 2019. The effects of combined high-intensity interval and resistance training on glycemic control and oxidative stress in T2DM. *Asian J Sport. Med.* 10: e91841.
- Surniyantoro, H.N.E., Sadewa, A.H., & Hastuti, P., 2018. Uncoupling Protein 2 (UCP2) as Genetic Risk Factor for Obesity in Indonesia is Different in Gender Stratification. *Kobe J. Med. Sci.* 64: E64–E72.
- Syauqy, A., Noer, E.R., Fajrani, A.M., Kurniawati, D., Purwanti, R., Rahadiyanti, A., et al., 2020. Dietary pattern were associated with obesity parameters among healthy women. *J. Nutr. Coll.* 9: 273–278.
- Talanian, J.L., Galloway, S.D.R., Heigenhauser, G.J.F., Bonen, A., & Spriet, L.L., 2007. Two weeks of high-intensity aerobic interval training increases the capacity for fat oxidation during exercise in women. *J. Appl. Physiol.* 102: 1439–1447. doi:10.1152/jappphysiol.01098.2006
- Thaker, V. V., Loos, R.J.F., & Yeo, G.S.H., 2021. The genetics of obesity: from discovery to biology. *Nat. Rev. Genet.* 0123456789: 379–405. doi:10.1038/s41576-021-00414-z
- Thompson, D., Karpe, F., Lafontan, M., & Frayn, K., 2012. Physical activity and exercise in the regulation of human adipose tissue physiology. *Physiol. Rev.* 92: 157–191. doi:10.1152/physrev.00012.2011

- Thyfault, J.P., Bergouignan, A., Costache, A.D., Costache, I.I., Miftode, R. Ștefan, Stafie, C.S., et al., 2020. Exercise and metabolic health: beyond skeletal muscle. *J. Clin. Med.* 10: 1–18. doi:10.1007/s00125-020-05177-6
- Townsend, J.R., Stout, J.R., Morton, A.B., Jajtner, A.R., Gonzalez, A.M., Wells, A.J., et al., 2013. Excess post-exercise oxygen consumption (EPOC) following multiple effort sprint and moderate aerobic exercise. *Kineziologija* 45: 16–21.
- Trapp, E.G., Chisholm, D.J., & Boutcher, S.H., 2007. Metabolic response of trained and untrained women during high-intensity intermittent cycle exercise. *Am. J. Physiol. Integr. Comp. Physiol.* 293: R2370–R2375. doi:10.1152/ajpregu.00780.2006
- Trapp, E.G., Chisholm, D.J., Freund, J., & Boutcher, S.H., 2008. The effects of high-intensity intermittent exercise training on fat loss and fasting insulin levels of young women. *Int. J. Obes.* 32: 684.
- Tucker, W.J., Angadi, S.S., & Gaesser, G.A., 2016. Excess postexercise oxygen consumption after high-intensity and sprint interval exercise, and continuous steady-state exercise. *J. Strength Cond. Res.* 30.
- Vink, R.G., Roumans, N.J.T., Arkenbosch, L.A.J., Mariman, E.C.M., & Van Baak, M.A., 2016. The effect of rate of weight loss on long-term weight regain in adults with overweight and obesity. *Obesity*. doi:10.1002/oby.21346
- Vogenberg, F.R., Barash, C.I., & Pursel, M., 2010. Personalized medicine - Part 1: Evolution and development into theranostics. *P T* 35.
- Wagner, D.R., & Heyward, V.H., 1999. Techniques of body composition assessment: A review of laboratory and field methods. *Res. Q. Exerc. Sport* 70: 135–149. doi:http://dx.doi.org/10.1080/02701367.1999.10608031
- Weston, K.S., Wisløff, U., & Coombes, J.S., 2014. High-intensity interval training in patients with lifestyle-induced cardiometabolic disease: a systematic review and meta-analysis. *Br. J. Sports Med.* 48: 1227 LP – 1234. doi:10.1136/bjsports-2013-092576
- Wewege, M., van den Berg, R., Ward, R.E., & Keech, A., 2017. The effects of high-intensity interval training vs. moderate-intensity continuous training on body composition in overweight and obese adults: a systematic review and meta-analysis. *Obes. Rev.* 18: 635–646. doi:10.1111/obr.12532
- Wijtzes, A.I., Bouthoorn, S.H., Jansen, W., Franco, O.H., Hofman, A., Jaddoe, V.W. V, et al., 2014. Sedentary behaviors, physical activity behaviors, and body fat in 6-year-old children: the Generation R Study. *Int. J. Behav. Nutr. Phys. Act.* 11: 96. doi:http://dx.doi.org/10.1186/s12966-014-0096-x
- World Health Organization, 2018. Obesity and overweight [WWW Document]. URL <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>

overweight (accessed 8.9.19).

World Health Organization, 2004. Appropriate body mass index for Asian populations and its implication for policy and intervention strategies. *Lancet* 363: 157–163.

World Health Organization Western Pacific Region, 2000. The Asia-Pacific perspective: redefining obesity and its treatment No Title [WWW Document]. *Geneva World Heal. Organ.* URL [http://www.wpro.who.int/nutrition/documents/Redefining\\_obesity/en/](http://www.wpro.who.int/nutrition/documents/Redefining_obesity/en/)

Yu, X., Wiecezorek, S., Franke, A., Yin, H., Pierer, M., Sina, C., et al., 2009. Association of UCP2 -866 G/A polymorphism with chronic inflammatory diseases. *Genes Immun.* 10: 601–605. doi:10.1038/gene.2009.29

Yumuk, V., Tsigos, C., Fried, M., Schindler, K., Busetto, L., Micic, D., et al., 2015. European guidelines for obesity management in adults. *Obes. Facts* 8: 402–424. doi:10.1159/000442721

Zatterale, F., Longo, M., Naderi, J., Raciti, G.A., Desiderio, A., Miele, C., et al., 2020. Chronic Adipose Tissue Inflammation Linking Obesity to Insulin Resistance and Type 2 Diabetes. *Front. Physiol.* 10: 1–20. doi:10.3389/fphys.2019.01607

Zhang, M., Wang, M., & Zhao, Z.T., 2014. Uncoupling protein 2 gene polymorphisms in association with overweight and obesity susceptibility: A meta-analysis. *Meta Gene.* doi:10.1016/j.mgene.2013.10.009

Zhang, S., Wang, L., Li, S., Zhang, W., Ma, X., Cheng, G., et al., 2018. Identification of potential key genes associated with adipogenesis through integrated analysis of five mouse transcriptome datasets. *Int. J. Mol. Sci.* 19. doi:10.3390/ijms19113557