

RECOMMENDATIONS

We recommend the followings:

1. Long term and regular but non strenuous physical activity, even for 30 minutes of activity over the course of the day, is an important strategy for the reduction or prevention of functional decline with aging.
2. Study the effect regular physical activity as a therapeutic low cost intervention in many organic and psychological diseases.
3. Study the effect of exercise training on immune markers.

REFERENCES

1. Hjelmborg J, Iachine I, Skytthe A, Vaupel JW, McGue M, Koskenvuo M, et al. Genetic influence on human lifespan and longevity. *Hum Genet* 2006; 119:312.
2. Breen L, Phillips SM. Skeletal muscle protein metabolism in the elderly: Interventions to counteract the 'anabolic resistance' of ageing. *Nutr Metab (Lond)* 2011;8:68.
3. Janssen I, Ross R. Linking age-related changes in skeletal muscle mass and composition with metabolism and disease. *J Nutr Health Aging* 2005; 9:408–19.
4. Galetta F, Franzoni F, Femia FR, Roccella N, Pentimone F, Santoro G. Lifelong physical training prevents the age-related impairment of heart rate variability and exercise capacity in elderly people. *J Sports Med Phys Fitness* 2005; 45:217-21.
5. American Geriatrics Society Panel on Exercise and Osteoarthritis. Exercise prescription for older adults with osteoarthritis pain: consensus practice recommendations. A supplement to the AGS Clinical Practice Guidelines on the Management of Chronic Pain in Older Adults. *J Am Geriatr Soc* 2001; 49:808– 23.
6. Brys K, Vanfleteren JR, Braeckman BP. Testing the rate-of-living/oxidative damage theory of aging in the nematode model *caenorhabditis elegans*. *Exp Gerontol* 2007; 42: 845–51.
7. Afanas'ev I. Signaling and damaging functions of free radicals in aging—free radical theory, hormesis, and TOR. *Aging Dis* 2010;1:75–88.
8. Davidovic M, Sevo G, Svorcan P, Milosevic DP, Despotovic N, Erceg P. Old age as a privilege of the selfish ones. *Aging Dis* 2010;1:139–46.
9. van Heemst D. Insulin, IGF-1 and longevity. *Aging Dis* 2010;1:147–57.
10. Iler AJ, van Gool WA, Eikelenboom P. The neuroinflammatory response in plaques and amyloid angiopathy in Alzheimer's disease: therapeutic implications. *Curr Drug Targets CNS Neurol Disord* 2005;4:223–33.
11. Sohal RS, Orr WC. The redox stress hypothesis of aging. *Free Radic Biol Med* 2012; 52(3): 539-55.
12. Chung HY, Cesari M, Anton S, Marzetti E, Giovannini S, Seo AY, et al. Molecular inflammation: Underpinnings of aging and age-related diseases. *Ageing Res Rev* 2009; 8:18-30.
13. Singh T, Newman AB. Inflammatory markers in population studies of aging. *Ageing Res Rev* 2011; 10(3):319-29.
14. Tracy RP. Emerging relationships of inflammation, cardiovascular disease and chronic diseases of aging. *Int J Obes Relat Metab Disord* 2003; 27(Suppl 3):S29-34.

References

15. Cannizzo ES, Clement CC, Sahu R, Follo C, Santambrogio L. Oxidative stress, inflamm- aging and immunosenescence. *J Proteomics* 2011; 74(11):2313-23.
16. Marzetti E, Hwang JC, Lees HA, Wohlgemuth SE, Dupont-Versteegden EE, Carter CS, et al. Mitochondrial death effectors: relevance to sarcopenia and disuse muscle atrophy. *Biochim Biophys Acta* 2010; 1800(3): 235-44.
17. Bua E, Johnson J, Herbst A, DeLong B, Mckenzie D, Salamat S, et al. Mitochondrial DNA-deletion mutations accumulate intracellularly to detrimental levels in aged human skeletal muscle fibers. *Am J Hum Genet* 2006; 79(3): 469-80.
18. Wei YH, Lee HC. Oxidative stress, mitochondrial DNA mutation, and impairment of antioxidant enzymes in aging. *Exp Biol Med (Maywood)* 2002; 227(9): 671-82.
19. Green DR, Galluzzi L, Kroemer G. Mitochondria and the autophagy-inflammation-cell death axis in organismal aging. *Science* 2011; 333(6046):1109-12.
20. Franceschi C, Bonafe M, Valensin S. Human immunosenescence: the prevailing of innate immunity, the failing of clonotypic immunity, and the filling of immunological space. *Vaccine* 2000; 18(16):1717-20.
21. Freund A, Orjalo AV, Desprez PY, Campisi J. Inflammatory networks during cellular senescence: causes and consequences. *Trends Mol Med* 2010; 16(5): 238-46.
22. Luz C, Dornelles F, Preissler T, Collaziol D, Da Cruz IM, Bauer ME. Impact of psychological and endocrine factors on cytokine production of healthy elderly people. *Mech Ageing Dev* 2003; 124(8-9):887-95.
23. Bauer ME, Jeckel CM, Luz C. The role of stress factors during aging of the immune system. *Ann N Y Acad Sci* 2009; 1153:139-52.
24. Traish AM, Kang HP, Saad F, Guay AT. Dehydroepiandrosterone (DHEA) — a precursor steroid or an active hormone in human physiology. *J Sex Med* 2011; 8(11):2960-83.
25. Kutsuzawa T, Shioya S, Kurita D, Haida M, Yamabayashi H. Effects of age on muscle energy metabolism and oxigenation in the forearm muscle. *J Med Sci Sports Exer* 2001; 33: 901-6.
26. Aagaard P, Suetta C, Caserotti P, Magnusson SP, Kjaer M. Role of the nervous system in sarcopenia and muscle atrophy with aging: strength training as a countermeasure. *Scand J Med Sci Sports* 2010; 20(1):49-64.
27. Janssen I. Evolution of sarcopenia research. *Appl Physiol Nutr Metab* 2010; 35: 707–12.
28. Krogh-Madsen R, Thyfault JP, Broholm C, Mortensen OH, Olsen RH, Mounier R, et al. Nutrient signalling in the regulation of human muscle protein synthesis. *J Appl Physiol* 2010; 108:1034–40.
29. Hartman JW, Tang JE, Wilkinson SB, Tarnopolsky MA, Lawrence RL, Fullerton AV, et al. Consumption of fat-free fluid milk after resistance exercise promotes greater lean mass accretion than does consumption of soy or carbohydrate in young, novice, male weightlifters. *Am J Clin Nutr* 2007; 86: 373–81.

References

30. McKenzie D, Bua E, McKiernan S, Cao Z, Aiken JM. Mitochondrial DNA deletion mutations: a causal role in sarcopenia. *Eur J Biochem* 2002; 269: 2010-5.
31. Kumar V, Selby A, Rankin D, Patel R, Atherton P, Hildebrandt W, et al. Age-related differences in the dose response relationship of muscle protein synthesis to resistance exercise in young and old men. *J Physiol* 2009; 587:211–7.
32. Burd NA, West DW, Moore DR, Atherton PJ, Staples AW, Prior T, et al. Enhanced amino acid sensitivity of myofibrillar protein synthesis persists for up to 24 h after resistance exercise in young men. *J Nutr* 2011; 141: 568–73.
33. Rasmussen BB, Fujita S, Wolfe RR, Mittendorfer B, Roy M, Rowe VL, et al. Insulin resistance of muscle protein metabolism in aging. *FASEB J* 2006; 20: 768–9.
34. Dickinson JM, Drummond MJ, Coben JR, Volpi E, Rasmussen BB. Aging differentially affects human skeletal muscle amino acid transporter expression when essential amino acids are ingested after exercise. *Clin Nutr* 2012; 32: 273–80.
35. Durham WJ, Casperson SL, Dillon EL, Keske MA, Paddon-Jones D, Sanford AP, et al. Age-related anabolic resistance after endurance-type exercise in healthy humans. *FASEB J* 2010; 24: 4117–27.
36. Farber MO, Mannix ET. Tissue wasting in patients with chronic obstructive pulmonary disease. *Neurol Clin* 2000; 18:245-62.
37. Giresi PG, Stevenson EJ, Theilhaber J, Koncarevic A, Parkington J, Fielding RA, et al. Identification of a molecular signature of sarcopenia. *Physiol Genomics* 2005; 21:253–63.
38. Dela F, Kjaer M. Resistance training, insulin sensitivity and muscle function in the elderly. *Essays Biochem* 2006; 42:75–88.
39. Visser M, Pahor M, Taaffe DR, Goodpaster BH, Simonsick EM, Newman AB, et al. Relationship of interleukin-6 and tumor necrosis factor-alpha with muscle mass and muscle strength in elderly men and women: the Health ABC Study. *J Gerontol A Biol Sci Med Sci* 2002; 57:M326–32 .
40. Inouye SK, Studenski S, Tinetti ME, Kuchel GA. Geriatric syndromes: clinical, research, and policy implications of a core geriatric concept. *J Am Geriatr Soc* 2007; 55: 780–91.
41. Olde-Rikkert MG, Rigaud AS, van Hoeyweghen RJ, e Graaf J. Geriatric syndromes: medical misnomer or progress in geriatrics?. *Neth J Med* 2003; 61: 83–7.
42. Cruz-Jentoft A, Landi F, Topinková E. Understanding sarcopenia as a geriatric syndrome. *Curr Opin Clin Nutr Metab Care* 2010; 13: 1–7.
43. Iannuzzi-Sucich M, Prestwood KM, Kenny AM. Prevalence of sarcopenia and predictors of skeletal muscle mass in healthy, older men and women. *J Gerontol A Biol Sci Med Sci* 2002; 57: M772–7.

References

44. Chien MY, Huang TY, Wu YT. Prevalence of sarcopenia estimated using a bioelectrical impedance analysis prediction equation in community-dwelling elderly people in Taiwan. *J Am Geriatr Soc* 2008; 56: 1710–5.
45. Cawthon PM, Marshall LM, Michael Y. Frailty in older men: prevalence, progression, and relationship with mortality. *J Am Geriatr Soc* 2007; 55: 1216–23.
46. Laurentani F, Russo C, Bandinelli S. Age-associated changes in skeletal muscles and their effect on mobility: an operational diagnosis of sarcopenia. *J Appl Physiol* 2003; 95: 1851–60.
47. Rolland Y, Czerwinski S, Abellan Van Kan G. Sarcopenia: its assessment, etiology, pathogenesis, consequences and future perspectives. *J Nutr Health Aging* 2008; 12: 433–50.
48. Topinkova E. Aging, disability and frailty. *Ann Nutr Metab* 2008; 526–11.
49. Hartman MJ, Fields DA, Byrne NM. Resistance training improves metabolic economy during functional tasks in older adults. *J Strength Cond Res* 2007; 21: 91–5.
50. Burd NA, West DW, Rerечich T, Prior T, Baker SK, Phillips SM. Validation of a single biopsy approach and bolus protein feeding to determine myofibrillar protein synthesis in stable isotope tracer studies in humans. *Nutr Metabol* 2011; 8:15.
51. Paddon-Jones D, Short KR, Campbell WW. Role of dietary protein in the sarcopenia of aging. *Am J Clin Nutr* 2008; 87: 1562S–6S.
52. Sayer AA, Syddall H, Martin H. The developmental origins of sarcopenia. *J Nutr Health Aging* 2008; 12: 427–32.
53. Chung HY, Kim HJ, Kim JW, Yu BP. The inflammation hypothesis of aging: molecular modulation by calorie restriction. *Ann NY Acad Sci* 2001;928:327–35.
54. Chung HY, Kim HJ, Kim KW, Choi JS, Yu BP. Molecular inflammation hypothesis of aging based on the anti-aging mechanism of calorie restriction. *Microsc Res Tech* 2002; 59: 264–72.
55. Chung HY, Sung B, Jung KJ, Zou Y, Yu BP. The molecular inflammatory process in aging. *Antioxid Redox Signal* 2006;8:572–81.
56. Yu BP, Chung HY. Adaptive mechanisms to oxidative stress during aging. *Mech Ageing Dev* 2006;127:436–43.
57. Kregel KC, Zhang HJ. An integrated view of oxidative stress in aging: basic mechanisms, functional effects, and pathological considerations. *Am J Physiol Regulatory Integr Compar Physiol* 2007; 292:R18–36.
58. Sui X, Lamonte MJ, Laditka JN. Cardiorespiratory fitness and adiposity as mortality predictors in older adults. *JAMA* 2007; 298: 2507–16.

References

59. Cowie CC, Rust KF, Byrd-Holt DD, Eberhardt MS, Flegal KM, Engelgau MM, et al. Prevalence of diabetes and impaired fasting glucose in adults in the U.S. population: National Health And Nutrition Examination Survey 1999–2002. *Diabetes Care* 2006;29:1263–8.
60. Libby P. Inflammation in atherosclerosis. *Nature* 2002;420(6917): 868–74.
61. Bruunsgaard H, Pedersen BK. Age-related inflammatory cytokines and disease. *Immunol Allergy Clin North Am* 2003; 23:15–39.
62. Ogawa K, Suzuki K, Mitsuharu O, Yamazaki K, Shinkai S. The association of elevated reactive oxygen species levels from neutrophils with low-grade inflammation in the elderly. *Immun Ageing* 2008; 5: Article ID 13.
63. Caspersen CJ, Pereira MA, Curran KM. Changes in physical activity patterns in the United States, by sex and cross-sectional age. *Med Sci Sports Exer* 2000;32:1601–9.
64. Coresh J, Selvin E, Stevens LA, Manzi J, Kusek JW, Eggers P, et al. Prevalence of chronic kidney disease in the United States. *JAMA* 2007; 298:2038–47.
65. Dagenais S, Garbedian S, Wai EK. Systematic review of the prevalence of radiographic primary hip osteoarthritis. *Clin Orthop Related Res* 2009;467:623–37.
66. Kalaria RN, Maestre GE, Arizaga R, Friedland RP, Galasko D, Hall K, et al. Alzheimer's disease and vascular dementia in developing countries: prevalence, management, and risk factors. *Lancet Neurol* 2008;7:812–26.
67. Carswell EA, Old LJ, Kassel RL, Green S, Fiore N, Williamson B. An endotoxin-induced serum factor that causes necrosis of tumors. *Proc Natl Acad Sci USA* 1975;72(9):3666–70.
68. Vassilakopoulos T, Karatza MH, Katsaounou P, Kollintza A, Zakynthinos S, Roussos C. Antioxidants attenuate the plasma cytokine response to exercise in [untrained] humans. *J Appl Physiol* 2003; 94(3):1025-32 .
69. Jousen AM, Poulaki V, Mitsiades N, Kirchhof B, Koizumi K, Döhmen S, Adamis AP. Nonsteroidal anti-inflammatory drugs prevent early diabetic retinopathy via TNF-alpha suppression. *FASEB J* 2002; 16(3):438-40.
70. Cenci S, Weitzmann MN, Roggia C, Namba N, Novack D, Woodring J. Estrogen deficiency induces bone loss by enhancing T-cell production of TNF-alpha. *J Clin Invest* 2000; 106(10):1229-37 .
71. Idriss HT, Naismith JH. TNF and the TNF receptor superfamily: structure–function relationship(s). *Microsc Res Tech* 2000;50(3):184-95.
72. Locksley RM, Killeen N, Lenardo MJ. The TNF and TNF receptor superfamilies: integrating mammalian biology. *Cell* 2001;104(4):487-501.
73. Bodmer JL, Schneider P, Tschoopp J. The molecular architecture of the TNF superfamily. *Trends Biochem Sci* 2002;27(1):19-26.

References

74. Faustman D, Davis M. TNF receptor 2 pathway: drug target for autoimmune diseases. *Nat Rev Drug Discovery* 2010;9(6):482-93.
75. Bradley JR. TNF-mediated inflammatory disease. *J Pathol* 2008;214(2):149-60
76. Bouwmeester T, Bauch A, Ruffner H, Angrand PO, Bergamini G, Croughton K, et al. A physical and functional map of the human TNF α /NF- κ B signal transduction pathway. *Nat Cell Biol* 2004;6(2):97–105.
77. Al-Lamki RS, Wang J, Skepper JN, Thiru S, Pober JS, Bradley JR. Expression of tumor necrosis factor receptors in normal kidney and rejecting renal transplants. *Lab Invest* 2001;81(11):1503–15.
78. Chan FK, Chun HJ, Zheng L, Siegel RM, Bui KL, Lenardo MJ. A domain in TNF receptors that mediates ligand-independent receptor assembly and signalling. *Science* 2000;288(5475):2351–4.
79. Yang J, Lin Y, Guo Z, Cheng J, Huang J, Deng L, et al. The essential role of MEKK3 in TNF-induced NF- κ B activation. *Nat Immunol* 2001;2:620–624.
80. Blonska M, Shambharkar PB, Kobayashi M, Zhang D, Sakurai H, Su B, et al. TAK1 is recruited to the tumor necrosis factoralpha (TNF α) receptor 1 complex in a receptor-interacting protein (RIP)-dependent manner and cooperates with MEKK3, leading to NF- κ B activation. *J Biol Chem* 2005;280: 43056–63.
81. Devin A, Lin Y, Yamaoka S, Li Z, Karin M, Liu Z. The α - and β -subunits of I κ B kinase (IKK) mediate TRAF2-dependent IKK recruitment to tumor necrosis factor (TNF) receptor 1 in response to TNF. *Mol Cell Biol* 2001;21:3986–94.
82. Chen ZJ. Ubiquitin signalling in the NF- κ B pathway. *Nat Cell Biol* 2005; 7:758–65.
83. Zhao Y, Conze DB, Hanover JA, Ashwell JD. Tumor necrosis factor receptor 2 signalling induces selective c-IAP1-dependent ASK1 ubiquitination and terminates mitogen-activated protein kinase signalling. *J Biol Chem* 2007;282(11):7777–82.
84. Mark KS, Trickler WJ, Miller DW. Tumor necrosis factor-alpha induces cyclooxygenase-2 expression and prostaglandin release in brain microvessel endothelial cells. *J Pharmacol Exp Therap* 2001;297(3):1051–8.
85. Boyle WJ, Simonet WS, Lacey DL. Osteoclast differentiation and activation. *Nature* 2003; 423(6937): 337-42.
86. Pixley FJ, Stanley ER. CSF-1 regulation of the wandering macrophage: complexity in action. *Trends Cell Biol* 2004; 14(11): 628-38.
87. Lam J, Takeshita S, Barker JE, Kanagawa O, Ross FP, Teitelbaum SL. TNFalpha induces osteoclastogenesis by direct stimulation of macrophages exposed to permissive levels of RANK ligand. *J Clin Invest* 2000; 106(12): 1481-8.
88. Kostenuik PJ, Shalhoub V. Osteoprotegerin: a physiological and pharmacological inhibitor of bone resorption. *Curr Pharm Des* 2001; 7(8): 613-35.

References

89. Raisz LG. Pathogenesis of osteoporosis: concepts, conflicts, and prospects. *J Clin Invest* 2005; 115(12): 3318-25.
90. Schett G. Effects of inflammatory and anti-inflammatory cytokines on the bone. *Eur J Clin Invest* 2011; 41(12):1361-6.
91. Redlich K, Hayer S, Maier A, Dunstan CR, Tohidast-Akrad M, Lang S, Turk B, et al. Tumor necrosis factor alpha-mediated joint destruction is inhibited by targeting osteoclasts with osteoprotegerin. *Arthritis Rheum* 2002; 46(3): 785-92.
92. Grounds MD1, Torrisi J. Anti-TNF-alpha (Remicade®) therapy protects dystrophic skeletal muscle from necrosis. *FASEB J* 2004;18(6):676-82.
93. Buch MH, Bingham SJ, Bryer D, Emery P. Long-term infliximab treatment in rheumatoid arthritis: subsequent outcome of initial responders. *Rheumatology* 2007; 46(7):1153-6.
94. Pepys MB, Hirschfield GM. C-reactive protein: a critical update. *J Clin Invest* 2003; 111 (12): 1805-12.
95. Tillett WS, Francis T. Serological reactions in pneumonia with an onprotein somatic fraction of pneumococcus. *J Exp Med* 1930; 52 (4): 561-71.
96. Mantovani A, Garlanda C, Doni A, Bottazzi B. Pentraxins in innate immunity: from C-reactive protein to the long pentraxin PTX3. *J Clin Immunol* 2008; 28(1):1-13.
97. Slade GD, Ghezzi EM, Heiss G, Beck JD, Riche E, Offenbacher S. Relationship between periodontal disease and c-reactive protein among adults in the atherosclerosis risk in communities study. *Arch Intern Med* 2003;163:1172-9.
98. Munoz M, Garcia-Vallejo JJ, Sempere JM, Romero R, Ollala E, Sebastian C. acute phase response in patients undergoing lumbar spinal surgery ; modulation by peroperative treatment with naproxen and famotidine. *Eur Spine J* 2004; 13(4):367-73.
99. Ridker PM, Hennekens CH, Buring JE, Rifai N. C-Reactive protein and other markers of inflammation in the prediction of cardiovascular disease in women. *N Engl J Med* 2003;342:836-43.
100. Sabet M, Lee SW, Nauman RK, Sims T, Um HS. The Surface (S) layer is a virulence factor of *Bacteroides forsythus*. *Microbiology* 2003;149: 3617-27.
101. McPherson RA, Matthew R, Pincus MR. Henry's clinical diagnosis and management by laboratory methods. 22nd ed. Philadelphia: Elsevier Saunders; 2011. 254-5.
102. Burris CA, Ash-wood ER, Burns DE. Tietz textbook of clinical chemistry and molecular diagnostics. 4th ed. St. Louis: Elsevier Saunders; 2006. 962-7.
103. Shaw A, Xu Q. Biomechanical stress-induced signaling in smooth muscle cells: an update. *Curr Vasc Pharmacol* 2003; 1: 41-58.

References

104. Block G, Jensen CD, Dalvi TB, Norkus EP, Hudes M, Crawford PB, et al. Vitamin C treatment reduces elevated C-reactive protein. *Free Radic Biol Med* 2009;46(1):70-7.
105. Corsonello A, Garasto S, Abbatecola AM, Rose G, Passarino G, Mazzei B, et al. Targeting inflammation to slow or delay functional decline: where are we?. *Biogerontology* 2010; 11:603–14.
106. Forsythe LK, Wallace JM, Livingstone MB. Obesity and inflammation: the effects of weight loss. *Nutr Res Rev* 2008; 117–33.
107. Kelly KR, Haus JM, Solomon TP, Patrick-Melin AJ, Cook M, Rocco M, et al. A low-glycemic index diet and exercise intervention reduces TNF(alpha) in isolated mononuclear cells of older, obese adults. *J Nutr* 2011;141: 1089–94.
108. Pate RR, O'Neill JR, Lobelo F. The evolving definition of sedentary. *Exerc Sport Sci Rev* 2008; 36:173–8.
109. Wen CP, Wai JPM, Tsai MK. Minimum amount of physical activity for reduced mortality and extended life expectancy: a prospective cohort study. *Lancet* 2011; 378:1244–53.
110. Chodzko-Zajko WJP, Proctor DNP, Fiatarone Singh MAM. Exercise and physical activity for older adults. *Med Sci Sports Exerc* 2009;41:1510–30.
111. Länsimies-Antikainen H, Pietilä AM, Laitinen T, Kiviniemi V, Rauramaa R. Is informed consent related to success in exercise and diet intervention as evaluated at 12 months? DR's EXTRA study. *BMC Medical Ethics* 2010;11(1): 9.
112. Tajiri Y, Kato T, Nakayama H, Yamada K. Reduction of skeletal muscle, especially in lower limbs, in Japanese type 2 diabetic patients with Insulin resistance and cardiovascular risk factors. *Metabol Syndrome Related Disord* 2010;8(2):137–42.
113. Warburton DE, Nicol CW, Bredin SS. Health benefits of physical activity: the evidence. *CMAJ* 2006; 174: 801–9.
114. Goodpaster BH, Park SW, Harris TB. The loss of skeletal muscle strength, mass, and quality in older adults: the health, aging and body composition study. *J Gerontol A Biol Sci Med Sci* 2006; 61:1059–64.
115. Rennie MJ, Selby A, Atherton P. Facts, noise and wishful thinking: muscle protein turnover in aging and human disuse atrophy. *Scand J Med Sci Sports* 2010; 20:5–9.
116. Christmas C, Andersen RA. Exercise and older patients: guidelines for the clinician. *J Am Geriatr Soc* 2000; 48: 318–24.
117. Drummond MJ, Dreyer HC, Pennings B, Fry CS, Dhanani S, Dillon EL. Skeletal muscle protein anabolic response to resistance exercise and essential amino acids is delayed with aging. *J Appl Physiol* 2008; 104:1452–61.
118. American College of Sports Medicine. American College of Sports Medicine position stand, progression models in resistance training for healthy adults. *Med Sci Sports Exerc* 2009;41(3):687-708.

References

119. Yarasheski KE. Exercise, aging, and muscle protein metabolism. *J Gerontol A Biol Sci Med Sci* 2003;58(10):M918-22.
120. Brolinson PG, Elliott D. Exercise and the immune system. *Clin Sports Med* 2007;26:311-9.
121. Fujita S, Rasmussen BB, Cadenas JG. Aerobic exercise overcomes the age-related insulin resistance of muscle protein metabolism by improving endothelial function and Akt/mammalian target of rapamycin signaling. *Diabetes* 2007; 56:1615-22.
122. Pennings B, Koopman R, Beelen M, Senden JM, Saris WH, van Loon LJ. Exercising before protein intake allows for greater use of dietary protein-derived amino acids for de novo muscle protein synthesis in both young and elderly men. *Am J Clin Nutr* 2011; 93:322-31.
123. Hughes V, Frontera W, Wood M, et al. Longitudinal muscle strength changes in the elderly: influence of muscle mass, physical activity and health. *J Gerontol Biol Sci* 2001;56:209-17.
124. König D, Deibert P, Winkler K, Berg A. Association between LDL-cholesterol, statin therapy, physical activity and inflammatory markers in patients with stable coronary heart disease. *Exer Immunol Rev* 2005;11:97-107.
125. Evans W. Exercise strategies should be designed to increase muscle power. *J Gerontol Med Sci* 2000; 55: 309-10.
126. Colbert LH, Visser M, Simonsick EM. Physical activity, exercise, and inflammatory markers in older adults: findings from the health, aging and body composition study. *J Am Geriatrics Soci* 2004;52(7):1098-104.
127. Nybo L, Sundstrup E, Jakobsen MD, Mohr M, Hornstrup T, Simonsen L, Bulow J, Randers MB, Nielsen JJ, Aagaard P, Krstrup P. High-intensity training versus traditional exercise interventions for promoting health. *Med Sci Sports Exerc* 2010;42:1951-8.
128. Visser M, Pluijm SMF, Stel VS, Bosscher RJ, Deeg DJH. Physical activity as a determinant of change in mobility performance: the longitudinal aging study Amsterdam. *J Am Geriatrics Soci* 2002; 50(11):1774-81.
129. Schragger MA, Metter EJ, Simonsick E. Sarcopenic obesity and inflammation in the InCHIANTI study. *J Appl Physiol* 2007;102(3):919-25.
130. Spruit MA, Gosselink R, Troosters T, Kasran A, Van Vliet M, Decramer M. Low-grade systemic inflammation and the response to exercise training in patients with advanced COPD. *Chest* 2005;128(5):3183-90.
131. Franceschi C. Inflammaging as a major characteristic of old people: can it be prevented or cured?. *Nutr Rev* 2007;65:S173-6.
132. Tracey KJ. Reflex control of immunity. *Nat Rev Immunol* 2009;9:418-28.

References

133. Harkins JM, Moustaid-Moussa N, Chung YJ, Penner KM, Pestka JJ, North CM, et al. Expression of interleukin-6 is greater in preadipocytes than in adipocytes of 3T3-L1 cells. *J Nutr* 2004;134:2673–7.
134. Routledge FS, Campbell TS, McFetridge-Durdle JA, Bacon SL. Improvements in heart rate variability with exercise therapy. *Can J Cardiol* 2010; 26:303–12.
135. Nelson ME, Rejeski WJ, Blair SN. Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. *Circulation* 2007;116(9):1094-105.
136. Peterson M, Rhea M, Sen A, Gordon P. Resistance exercise for muscular strength in older adults: a meta-analysis. *Ageing Res Rev* 2010;9(3):226-37.
137. Ivey FM, Roth SM, Ferrell RE. Effects of age, gender, and myostatin genotype on the hypertrophic response to heavy resistance strength training. *J Gerontol A Biol Sci Med Sci* 2000;55:M641-8.
138. Izquierdo M, Häkkinen K, Ibanez J. Effects of strength training on muscle power and serum hormones in middle-aged and older men. *J Appl Physiol* 2001;90(4):1497-507.
139. Klein CS, Marsh GD, Petrella RJ, Rice CL. Muscle fiber number in the biceps brachii muscle of young and old men. *Muscle Nerve* 2003;28(1):62-8.
140. Earles DR, Judge JO, Gunnarsson OT. Velocity training induces power-specific adaptations in highly functioning older adults. *Arch Phys Med Rehabil* 2001;82:872-8.
141. Fielding RA, Le Brasseur NK, Cuoco A, Bean J, Mizer K, Fiatarone-Singh MA. High-velocity resistance training increases skeletal muscle peak power in older women. *J Am Geriatr Soc* 2002; 50:655-62.
142. Newton RU, Hakkinen K, Hakkinen A, McCormick M, Volek J, Kraemer WJ. Mixed-methods resistance training increases power and strength of young and older men. *Med Sci Sports Exerc* 2002;34(8):1367-75.
143. Bamman MM, Hill VJ, Adams GR. Gender differences in resistance-training-induced myofiber hypertrophy among older adults. *J Gerontol A Biol Sci Med Sci* 2003;58(2):108-16.
144. Häkkinen K, Alen M, Kallinen M, Newton RU, Kraemer WJ. Neuromuscular adaptation during prolonged strength training, detraining and re-strength-training in middle-aged and elderly people. *Eur J Appl Physiol* 2000;83(1):51-62.
145. Reeves ND, Maganaris CN, Narici MV. Effect of strength training on human patella tendon mechanical properties of older individuals. *J Physiol* 2003; 548(Pt 3):971-81.
146. Häkkinen K, Kraemer WJ, Newton RU, Alen M. Changes in electromyographic activity, muscle fibre and force production characteristics during heavy resistance/power strength training in middle-aged and older men and women. *Acta Physiol Scand* 2001;171:51-62.

References

147. Martel GF, Roth SM, Ivey FM. Age and sex affect human muscle fibre adaptations to heavy-resistance strength training. *Exp Physiol* 2006;91(2):457-64.
148. Welle S, Bhatt K, Shah B, Thornton C. Insulin-like growth factor-1 and myostatin mRNA expression in muscle: comparison between 62-77 and 21-31 yr old men. *Exp Gerontol* 2002;37(6):833-9.
149. Garrido P. Aging and stress: past hypotheses, present approaches and perspectives. *Aging Dis* 2011;2:80-99.
150. Ryan AS. Exercise in aging: its important role in mortality, obesity and insulin resistance. *Aging health* 2010;6:551- 63.
151. Kallio J, Avela J, Moritani T, Kanervo M, Selänne H, Komi P, et al. Effects of ageing on motor unit activation patterns and reflex sensitivity in dynamic movements. *J Electromyogr Kinesiol* 2010;20:590-8.
152. Lapointe BM, Fremont P, Cote CH. Adaptation to lengthening contractions is independent of voluntary muscle recruitment but relies on inflammation. *Am J Physiol Regul Integr Comp Physiol* 2002;282:R323-9.
153. Beavers KM, Brinkley TE, Nicklas BJ. Effect of exercise training on chronic inflammation. *Clin Chim Acta* 2010;411:785-93.
154. Woods JA, Vieira VJ, Keylock KT. Exercise, inflammation, and innate immunity. *Immunol Allergy Clin North Am* 2009; 29:381-93.
155. Stewart LK, Flynn MG, Campbell WW. Influence of exercise training and age on CD14⁺ cell-surface expression of toll-like receptor 2 and 4. *Brain Behav Immun* 2005; 19(5): 389-97.
156. Xu H, Barnes GT, Yang Q, Tan G, Yang D, Chou CJ, et al. Chronic inflammation in fat plays a crucial role in the development of obesity-related insulin resistance. *J Clin Invest* 2003; 112: 1821-30.
157. Cinti S, Mitchell G, Barbatelli G, Murano I, Ceresi E, Faloia E, et al. Adipocyte death defines macrophage localization and function in adipose tissue of obese humans. *J Lipid Res* 2005; 46: 2347-55.
158. Wu D, Ren Z, Pae M, Guo W, Cui X, Merrill AH, et al. Aging up-regulates expression of inflammatory mediators in mouse adipose tissue. *J Immunol* 2007; 179: 4829-39.
159. Vuori I. Dose-response of physical activity and low back pain, osteoarthritis, and osteoporosis. *Med Sci Sports Exerc* 2001; 33(Suppl 6):S551- 86.
160. Hunter GR, Wetzstein CJ, Fields DA, Brown A, Bamman MM. Resistance training increases total energy expenditure and free-living physical activity in older adults. *J Appl Physiol* 2000;89:977-84.

References

161. Gleeson M. Immune function in sport and exercise. *J Appl Physiol* 2007;103:693–9.
162. de Gonzalo-Calvo D, Fernández-García B, de Luxán-Delgado B. Long-term training induces a healthy inflammatory and endocrine emergent biomarker profile in elderly men. *Age* 2012; 34(3):761–71.
163. Goldman L, Schafer AI . *Cecil Medicine* 24th ed, Elsevier; 2011: 161.
164. Mann J. Dietary fiber and diabetes revisited . *Eur J Clin Nutr* 2001; 55: 919-21.
165. Edmund L, David J. Kidney function tests. In: Carl AB, Edward R, David E, editors. *Tietz Textbook of clinical chemistry and molecular diagnostics*. Elsevier 2006:797–808.
166. Levey AS, Greene T, Kusek J. A simplified equation to predict glomerular filtration rate from serum creatinine. *J Am Soc Nephrol* 2000;11:828.
167. Goldhammer E, Tanchilevitch A, Maor I, Beniamini Y, Rosenschein U, Sagiv M. Exercise training modulates cytokines activity in coronary heart disease patients. *Int J Cardiol* 2005; 100: 93–9.
168. Croft M. The role of TNF superfamily members in T-cell function and diseases. *Nature Rev Immunol* 2009; 9(4):271-85.
169. Pearson TA, Mensah GA, Alexander RW. Markers of inflammation and cardiovascular disease:application to clinical and public health practice :a statement for health care professionals from the Centers for Disease Control and Prevention and the American Heart Association .*Circulation* 2003;107:499-511.
170. Ridker PM, Rifai N, Rose L. Comparison of c-reactive protein and low density lipoprotein cholesterol levels in the prediction of first cardiovascular events. *N Engl J Med* 2002; 347:1557-65.
171. Ridker PM, Stampfer MJ, Rifai N. Novel risk factor for systemic atherosclerosis : a comparison of c-reactive protein, fibrinogen, homocysteine, lipoprotein (a), and standard cholesterol screening as predictors of peripheral arterial disease. *JAMA* 2001; 285:2481-5.
172. Heeschen C, Hamm C, Bruemmer J. Predictive value of c-reactive protein and troponin tT in patients with unstable angina: a comparative analysis. *J Am Coll Cardiol* 2000 ; 35:1535-42.
173. Chenillot O, Henny J, Steinmetz J. High sensitivity C-reactive protein: biological variations and reference limits. *Clin Chem Lab Med* 2000;38:1003-11.
174. Argile's J, Busquets S, Felipe A, Lo'pez-Soriano F. Molecular mechanisms involved in muscle wasting in cancer and ageing: cachexia versus sarcopenia. *Intern J Biochem Cell Biol* 2005; 37:1084-94.
175. Sanada K, Kearns CF, Midorikawa T, Abe T. Prediction and validation of total and regional skeletal muscle mass by ultrasound in Japanese adults. *Eur J Appl Physiol* 2006;96:24–31.

References

176. Leslie E, Geoffrey J, James M. Interpretation and uses of medical statistics. 4thed. Oxford, UK: Oxford Scientific Publications(pub); 1991. 411-6.
177. Kirkpatrick LA, Feeney BC. A simple guide to IBM SPSS statistics for version 20.0. Student ed. Belmont, Calif.: Wadsworth, Cengage Learning; 2013..
178. Guillet C, Prod'homme M, Balage M. Impaired anabolic response of muscle protein synthesis is associated with S6K1 dysregulation in elderly humans. *FASEB J* 2004; 18:1586–7.
179. Buford TW, Willoughby DS. Impact of DHEA(S) and cortisol on immune function in aging: a brief review. *Appl Physiol Nutr Metab* 2008; 33(3):429-33.
180. Fleg JL, Morrell CH, Bos AG. Accelerated longitudinal decline of aerobic capacity in healthy older adults. *Circulation* 2005; 112: 674–82.
181. Abu-Amer Y, Erdmann J, Alexopoulou L, Kollias G, Ross FP, Teitelbaum SL. Tumor necrosis factor receptors types 1 and 2 differentially regulate osteoclastogenesis. *J Biol Chem* 2000; 275(35): 27307-10.
182. Mattusch F, Dufaux B, Heine O, Mertens I, Rost R. Reduction of the plasma concentration of C-reactive protein following nine months of endurance training. *Int J Sports Med* 2000;21(1):21–4.
183. Kokkinos P, Myers J. Exercise and physical activity: clinical outcomes and applications. *Circulation* 2010;122:1637–48.
184. Ogawa K, Sanada K, Machida S, Okutsu M, Suzuki K. Resistance exercise training-induced muscle hypertrophy was associated with reduction of inflammatory markers in elderly women. *Mediators Inflamm* 2010; 2010: 171023.
185. Yu Z, Ye X, Wang J, Qi Q, Franco OH, Rennie KL, et al. Associations of physical activity with inflammatory factors, adipocytokines, and metabolic syndrome in middle-aged and older Chinese people. *Circulation* 2009;119:2969–77.
186. Greiwe JS, Cheng B, Rubin DC, Yarasheski KE, Semenkovich CF. Resistance exercise decreases skeletal muscle tumor necrosis factor alpha in frail elderly humans. *Faseb J* 2001;15:475–82.
187. Elosua R, Bartali B, Ordovas JM, Corsi AM, Lauretani F, Ferrucci L, et al. Association between physical activity, physical performance, and inflammatory biomarkers in an elderly population: the InCHIANTI study. *J Gerontol A Biol Sci Med Sci* 2005;60:760–7.
188. Geffken DF, Cushman M, Burke GL, Polak JF, Sakkinen PA, Tracy RP. Association between physical activity and markers of inflammation in a healthy elderly population. *Am J Epidemiol* 2001;153:242–50.
189. Taaffe DR, Harris TB, Ferrucci L, Rowe J, Seeman TE. Cross-sectional and prospective relationships of interleukin-6 and c-reactive protein with physical performance in elderly persons: MacArthur studies of successful aging. *J Gerontol A Biol Sci Med Sci* 2000;55(12):M709–15.

References

190. Campbell PT, Campbell KL, Wener MH, Wood BL, Potter JD, McTiernan A, et al. A yearlong exercise intervention decreases CRP among obese postmenopausal women. *Med Sci Sports Exerc* 2009;41:1533–9.
191. Reuben DB, Judd-Hamilton L, Harris TB, Seeman TE. The associations between physical activity and inflammatory markers in high-functioning older persons: MacArthur Studies of Successful Aging. *J Am Geriatr Soc* 2003;51(8):1125-30.
192. McFarlin BK, Flynn MG, Campbell WW. Physical activity status, but not age, influences inflammatory biomarkers. *J Gerontol* 2006;61:388–93.
193. Shahram S. Exercise type and Inflammatory Markers CRP in Aging. *Men J Exp Bio* 2011; 1 (4): 221-5.
194. Moreno G, Mangione CM, Wang PC, Trejo L, Butch A, Tseng CH, et al. Physical Activity, Physical Performance, and Biological Markers of Health among Sedentary Older Latinos. *Curr Gerontol Geriatr Res* 2014;2014:535071.
195. Kohut ML, McCann DA, Russell DW, Konopka DN, Cunnick JE, Franke WD, et al. Aerobic exercise, but not flexibility/resistance exercise, reduces serum IL-18, CRP, and IL-6 independent of beta-blockers, BMI, and psychosocial factors in older adults. *Brain Behav Immun* 2006;20:201–9.
196. Vieira VJ, Hu L, Valentine RJ, McAuley E, Evans EM, Baynard T, et al. Reduction in trunk fat predicts cardiovascular exercise training-related reductions in C-reactive protein. *Brain Behav Immun* 2009;23:485–91.
197. Martins RA, Neves AP, Coelho-Silva MJ, Verissimo MT, Teixeira AM. The effect of aerobic versus strength-based training on high-sensitivity C-reactive protein in older adults. *Eur J Appl Physiol* 2010;110:161–9.
198. Pereira DS, Mateo EC, de Queiroz BZ, Assumpcao AM, Miranda AS, Felicio DC, et al. TNF-alpha, IL6, and IL10 polymorphisms and the effect of physical exercise on inflammatory parameters and physical performance in elderly women. *Age (Dordr)* 2013;35(6):2455-63.
199. Nicklas BJ, Mychaleckyj J, Kritchevsky S, Palla S, Lange LA, Lange EM, et al. Physical function and its response to exercise: associations with cytokine gene variation in older adults with knee osteoarthritis. *J Gerontol A Biol Sci Med Sci* 2005;60(10):1292-8.
200. Cesari M, Penninx BW, Pahor M, Lauretani F, Corsi AM, Rhys Williams G, et al. Inflammatory markers and physical performance in older persons: the InCHIANTI study. *J Gerontol A Biol Sci Med Sci* 2004;59(3):242-8.
201. Beavers KM, Hsu FC, Isom S, Kritchevsky SB, Church T, Goodpaster B, et al. Long-term physical activity and inflammatory biomarkers in older adults. *Med Sci Sports Exerc* 2010; 42: 2189-96.

References

202. Kapasi ZF, Ouslander JG, Schnelle JF, Kutner M, Fahey JL. Effects of an exercise intervention on immunologic parameters in elderly nursing home residents. *J Gerontol A Biol Sci Med Sci* 2003;58:636–43.
203. Hammett CJK, Oxenham HC, Baldi JC, Doughty RN, Ameratunga R, French JK, et al. Effect of six months' exercise training on C-reactive protein levels in healthy elderly subjects. *Journal of the American College of Cardiology* 2004;44:2411–3.
204. Rahimi A, Hojjat S, Besharati A, Shokrgozar A, Masoumi S. The effect of an aerobic exercise on IL6, CRP and TNFa concentration in women. *Ann Biol Res* 2012; 3(1):125-31.

obeykandi.com

المخلص العربي

يمكن تعريف الشيخوخة باعتبارها آلية معقدة من عمليات تدريجية لا رجعة فيها وهي تحدث في الجزيئات و الخلايا وتؤدي في النهاية إلى موت الأجهزة الحيوية. و يفهم أفضل للآليات الجزيئية والخلوية للشيخوخة نجد بعض الأمل في إيجاد الحلول الممكنة لإبطاء عملية الشيخوخة .

وقد اقترحت نظرية الإلتهابات الجزيئية للشيخوخة تورط الأوكسجين التفاعلي ، النيوتروجين و بعض الجزيئات المحفزة في عملية الشيخوخة وإعتبارهم عناصر رئيسية مشاركة فيها. كما يساهم أيضا ارتفاع معدل الاكسدة في تنمية وجود الإلتهابات والأمراض المزمنة المصاحبة للشيخوخة.

كما يُعرف **الإلتهاب المزمن ذو الدرجة المنخفضة** بأنه ارتفاع بسيط في مستوى تركيزات السيتوكينات المؤالية للإلتهابات في الجسم مثل: مُعامل نخر الورم -ألفا (TNF- α) و مُختصر البروتين التفاعلي- سي (C-RP) كمثالاً للبروتينات الحادة ؛ و يرتبط هذا الإلتهاب بتصلب الشرايين ومقاومة الإنسولين. هناك ارتباط وثيق بين الارتفاعات المزمنة من الدرجة المنخفضة في هذه الجزيئات المحفزة للإلتهابات و ما بين خطر ارتفاع معدلات المراضة بشكل مستقل عن الأمراض الموجودة مسبقاً، مما يشير إلى أن هذه السيتوكينات المسنين غير ملاحظة إكلينيكياً .

و تُمثل تدخلات نمط الحياة كممارسة التمارين الرياضيه والحيمه الغذائية بديلاً منخفض التكلفة و ممتد المفعول للحد من الإلتهابات والتدهور الحيوي للمُسن . كما يُوصى بالمواظبة على النشاط البدني واعتباره استراتيجية هامة للحد من التدهور الوظيفي المُصاحب للشيخوخة. وبالإضافة إلى ذلك، فإن النشاط البدني يُقلل من خطر الإصابة بعدد كبير من الأمراض المزمنة .

هدفنا في هذه الدراسة إلى :

دراسة مستوى مختصر البروتين التفاعلي- سي (CRP) و معامل نخر الورم- ألفا (TNF- α) عند كبار السن قبل و بعد القيام بتمارين مقاومة .

المرضى ومواد البحث :

لقد أجريت هذه الدراسة علي إجمالي ٣٠ مُسن تتراوح أعمارهم بين ٦٠ عاماً أو أكثر، من كلا الجنسين، من ليس لهم أي تاريخ مرضي مثل مرض السكري، ارتفاع ضغط الدم ، أمراض الكبد أو أمراض الكلى.وقد تم الإستعانه بهؤلاء المُسنين من خلال توافدهم على قسم الطب الطبيعي، أمراض الروماتيزم والتأهيل في مستشفى الحضرة بجامعة الإسكندرية ، حيث تم أخذ التاريخ المرضي الكامل منهم ، وتم أيضاً عمل الفحص السريري الكامل و تم القيام بعمل رسم قلب (ECG) لكل المشاركين في الدراسة قبل بدء التمرينات.

كما تم عمل هذه الفحوصات المعملية للمجموعة التي تمت عليها الدراسة :

• **الفحوص المختبرية الروتينية:** صورة دم كاملة، سكر عشوائي في الدم (RBS)، وإختبارات وظائف الكلى مُتمثله في: البولينا ، الكرياتينين في الدم وتقييم معدل ترشيح الكبيبي الكلوي (GFR) من خلال تعديل النظام الغذائي في مجال أمراض الكلى (MDRD) .

• **الدلالات المعملية الدقيقة للإلتهابات :** (و قد تم قياسها مرتين قبل وبعد ممارسة التمارين)

١. مُعامل نخر الورم-ألفا (TNF- α) .

٢. - مُختصر البروتين التفاعلي- سي (CRP).

تدريبات المقاومة البدنية :

جميع كبار السن المشاركين في هذه الدراسة تعرضوا لجلسات تدريبيه لممارسة تمارين مقاومه بدنية ثلاث مرات أسبوعياً لمدة أربعة أسابيع متتاليه . وقد اشتمل البرنامج التدريبي ممارسة منخفضة الحدة تم تنفيذها على جهاز كينسيس (Kinesis) لكلا الأطراف العلوية والسفلية.وتكون التدريب من ثلاث مراحل: فترة الإحماء الأوليه لمدة خمس دقائق ، وانتهت بفترة راحه وإسترخاء لمدة خمس دقائق أخرى ،بينهما فترة تدريبات المقاومة الرئيسييه لمدة ٣٠ دقيقة والتي تتألف من:

- تدريب المقاومة لعضلات الإبتناء الخلفي للساق (dorsiflexors) (ويتم عن طريق إرفاق كابل يربط بالقدم من الأرض، ثم يتم رفع كل ساق علي حداً لأعلى بصورة متكرره).
- تدريبات الجر الأماميه للجزع (ويتم فيها الإستعانه بكابل يُشد أفقياً ويُجر للأمام أيضاً بصورة متكرره).
- تدريبات الجر العمودي للأطراف العلوية (و يتم تنفيذها عن طريق شد الكابل من أعلى لأسفل بإستخدام الذراعين منفصلين كلا عل حده بحركات متكرره).

و قد أسفرت نتائج هذه الدراسة عن :

إنخفاض ملحوظ وذو دلالة إحصائية في مستوى كل من مُعامل نخر الورم-ألفا (TNF- α) و مُختصر البروتين التفاعلي- سي(CRP) وذلك عند إعادة قياسهما بعد الإبتناء من أداء برنامج تمارين المقاومة البدنيه لمدة أربعة أسابيع متتاليه ، وذلك قياساً بمستواهما في البداية قبل ممارسة التمارين في نفس الأفراد.

طبقاً للنتائج السابقة يمكن أن نصل إلى استنتاج مفاده أن:

- هناك إرتباط سلبى و ذو دلالة إحصائية بين مستوي كل من مُعامل نخر الورم-ألفا (TNF- α) و مُختصر البروتين التفاعلي- سي(CRP) في مصل الدّم وبين تمارين المقاومة البدنيه.
- ممارسة تمارين المقاومة تُمثل إستراتيجية بل و آليه مُنخفضة التكلفة تعمل علي تقليل الإلتهابات المُرتبطة بتقدم العمر من خلال خفض مستويات دلالات الإلتهابات مما يؤدي إلي تحسين نوعي في نمط الحياة لدى كبار السن.



جامعة الإسكندرية
كلية الطب
قسم الأمراض الباطنة

دراسة مستوى مختصر البروتين التفاعلي و معامل نخر الورم-الفا عند
كبار السن قبل و بعد القيام بتمارين مقاومة

رسالة مقدمة

لقسم الأمراض الباطنة - كلية الطب - جامعة الإسكندرية
ضمن متطلبات درجة

الماجستير

فى

الأمراض الباطنة

من

شيماء أحمد إبراهيم محمود عبد المنعم

بكالوريوس الطب والجراحة، ٢٠٠٦

كلية الطب، جامعة الإسكندرية

[٢٠١٥]



جامعة الإسكندرية
كلية الطب
قسم الأمراض الباطنة

دراسة مستوى مختصر البروتين التفاعلي و معامل نخر الورم-الفا عند
كبار السن قبل و بعد القيام بتمارين مقاومة

رسالة مقدمة من

شيماء أحمد إبراهيم محمود عبد المنعم

للحصول على درجة

الماجستير

في

الأمراض الباطنة

التوقيع

.....

.....

.....

لجنة المناقشة والحكم على الرسالة

أ.د/ محمد احمد مهنا
أستاذ الأمراض الباطنة
قسم الأمراض الباطنة
كلية الطب
جامعة الإسكندرية

أ.د/ نهى محمد الصباغ
أستاذ الأمراض الباطنة
قسم الأمراض الباطنة
كلية الطب
جامعة الإسكندرية

أ.د/ عبلة إبراهيم أيوب
أستاذ صحة المسنين
قسم صحة الأسرة
المعهد العالى للصحة العامة
جامعة الإسكندرية

التاريخ / /

لجنة الإشراف

موافقون

أ.د/ نهى محمد الصباغ

أستاذ الأمراض الباطنة
قسم الأمراض الباطنة
كلية الطب
جامعة الإسكندرية

د/ إيناس محمد شاهين

أستاذ مساعد الطب الطبيعي والروماتيزم والتأهيل
قسم الطب الطبيعي والروماتيزم والتأهيل
كلية الطب
جامعة الإسكندرية

المشرفان المشاركان

د/ نانى حسن أبو المكارم

مدرس الأمراض الباطنة
قسم الأمراض الباطنة
كلية الطب
جامعة الإسكندرية

د/ رانية شفيق سويلم

مدرس الباثولوجيا الإكلينيكية والكيميائية
قسم الباثولوجيا الإكلينيكية والكيميائية
كلية الطب
جامعة الإسكندرية