

Fall Risk Assessment in Elderly with and without history of falls. Strength Analysis of Lower Limb. A comparative study

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INTRODUCTION

Falls in the elderly are a major public concern in terms of morbidity, mortality and costs to health and social services.

With aging there is a decrease of balance, flexibility, range of motion, neuromotor function and muscle mass.

Should be checked which people that are in greater risk of falling, in order to maximize the effectiveness of any prevention strategy, this requires knowing the causes and possible risk factors that cause falls.

The most important risk factors for falls in the elderly is to highlight the decrease in muscle strength and problems with walking and balance. Decreased muscle strength is extremely common among the elderly and is associated with an increased risk of falls.

A good muscle function of the joints of the hip, knee and ankle, is essential, these being key joints in postural control strategies used in an attempt to prevent falls.

OBJECTIVES

The aim of this study was to analyse muscle's performance parameters of flexor and extensor muscles of the knee and ankle of elderly with and without a history of falls.

SAMPLE

Non-probability, convenience, consisted of 30 elderly volunteers

- WHF Group: 15 individuals with a history of falls;
- WOHF Group: 15 individuals without history of falls.

INCLUSION CRITERIA

WHF group:

- Having ≥ 65 years;
- Having suffered 1 or more falls during the last year;
- Sign the informed consent.

WOHF group:

- Having ≥ 65 years;
- Have not suffered falls over the past year;
- Sign the informed consent.

EXCLUSION CRITERIA

- Products need to perform gait support;
- Possess a condition affecting the lower limbs and/or the gait.

MATERIALS AND METHODS

- Isokinetic dynamometer Biodex System 3® according to **BIODEX** Multi-Joint System-Pro

- **Peak Torque** (N.m/kg)
- **Ratio** flexor_{con}/extensor_{con}
- **Angular speed** 60°/s
- **Five replications**

RESULTS

	Movement	WOHF	WHF	p
Peak torque per unit mass (N.m/kg) ankle	Dorsiflexion	33,61±25,31	32,44±10,31	0,31
	Plantar flexion	39,52±14,30	40,04±14,09	0,967
Ratio FlexorsCon/ExtensorsCon % ankle	Dominant	116,18±139,53	98,56±72,87	0,443
Peak torque per unit mass (N.m/kg) knee	Flexion	75,39±25,79	69,45±24,28	0,604
	Extension	124,66±40,68	111,75±32,33	0,604
Ratio FlexorsCon/ExtensorsCon % knee	Dominant	61,46±11,55	61,86±11,04	0,693

CONCLUSION

The group of elderly with history of falls showed lower Peak Torque numbers per unit of mass for the knee and ankle joint comparing with the group without history of falls. In present research also the values of the ratio flexors_{con}/Extensors_{con} were analyzed and weren't found any differences in the knee and ankle joints.

We conclude that although being similar, because no statistically significant differences were found, the strength for dorsiflexion and knee flexion of the dominant leg is lower for the WHF group therefore we believe it will be beneficial to include strengthening exercises for the flexors and extensors muscles of these joints, thereby contributing to the prevention of falls.

BIBLIOGRAPHY

- American College of Sports Medicine Position Stand. Exercise and physical activity for older adults. *Med Sci Sports Exerc.* 1998;30(6):992-1008.
- Aquino Mde A, Leme LE, Amatuzzi MM, Greve JM, Terreri AS, Andrusaitis FR, et al. Isokinetic assessment of knee flexor/extensor muscular strength in elderly women. *Rev Hosp Clin Fac Med Sao Paulo.* 2002;57(4):131-4.
- Bento PC, Pereira G, Ugrasovitsch C, Rodacki AL. Peak torque and rate of torque development in elderly with and without fall history. *Clin Biomech.* 2010;25(5):450-4.
- Brill PA, Macera CA, Davis DR, Blair SN, Gordon N. Muscular strength and physical function. *Med Sci Sports Exerc.* 2000;32(2):412-6.
- Carvalho, J, Oliveira, J, Magalhães, J, Ascensão, A, Mota, J, Soares JMC. Força muscular em idosos 1 - Será o treino generalizado suficientemente intenso para promover o aumento da força muscular em idosos de ambos os sexos? *Revista Portuguesa de Ciências do Desporto.* 2004;4:51-7.
- Chan BK, Marshall LM, Winters KM, Faulkner KA, Schwartz AV, Orwoll ES. Incident fall risk and physical activity and physical performance among older men: the Osteoporotic Fractures in Men Study. *Am J Epidemiol.* 2007;165(6):696-703.
- Crews DE, Zavoitka S. Aging, disability, and frailty: implications for universal design. *J Physiol Anthropol.* 2006;25(1):113-8.
- Deschenes MR. Effects of aging on muscle fibre type and size. *Sports Med.* 2004;34(12):809-24.
- DGS. Promoção da saúde » Educação para a saúde » Áreas de intervenção » Acidentes e sua prevenção. 2007. Available from: <http://www.dgs.pt/>.
- Drouin JM, Valovich-LeToc TC, Shultz SJ, Gansseder BM, Perrin DH. Reliability and validity of the Biodex system 3 pro isokinetic dynamometer velocity, torque and position measurements. *Eur J Appl Physiol.* 2004;91(1):22-9.
- Frontiera WR, Hughes VA, Fielding RA, Fiatarone MA, Evans WJ, Roubenoff R. Aging of skeletal muscle: a 12-yr longitudinal study. *J Appl Physiol.* 2000;88(4):1321-6.
- Gonçalves, RS, Pinheiro JP. Evolução do Conceito de razão Isquiotibiais/Quadriceps na análise da articulação do joelho *Revista Portuguesa de Medicina Desportiva.* 2003;21:5-10.
- Heitmann DK, Gossman MR, Shaddeau SA, Jackson JR. Balance performance and step width in noninstitutionalized, elderly, female fallers and nonfallers. *Phys Ther.* 1989;69(11):923-31.
- INE. Censos 2011-Resultados Provisórios 2011.
- INE. O Envelhecimento em Portugal: Situação demográfica e sócio-económica recente das pessoas idosas. *Revista de Estudos Demográficos.* 2002.
- Koski K, Luukinen H, Laippala P, Kivela SL. Physiological factors and medications as predictors of injurious falls by elderly people: a prospective population-based study. *Age Ageing.* 1996;25(1):29-38.
- Leyk D, Ruther T, Wunderlich M, Sievert A, Essfeld D, Witzki A, et al. Physical performance in middle age and old age: good news for our sedentary and aging society. *Dtsch Arztebl Int.* 2010;107(46):809-16.
- Marigold DS, Patla AE. Strategies for dynamic stability during locomotion on a slippery surface: effects of prior experience and knowledge. *J Neurophysiol.* 2002;88(1):339-53.
- Masud T, Morris RO. Epidemiology of falls. *Age Ageing.* 2001;30:3-7.
- Perry MC, Carville SF, Smith IC, Rutherford OM, Newham DJ. Strength, power output and symmetry of leg muscles: effect of age and history of falling. *Eur J Appl Physiol.* 2007;100(5):553-61.
- Pinho I, DR, Freire MTF, Tavares CF, Dias JMD. Avaliação isocinetica da função muscular do quadril e do tornozelo em idosos que sofrem quedas. *Rev Bras Fisioter.* 2005;9:93-9.
- Rubenstein LZ. Falls in older people: epidemiology, risk factors and strategies for prevention. *Age Ageing.* 2006;35(2):187-191.
- Siqueira FV, Facchini LA, Piccini RX, Tomasi E, Thume E, Silveira DS, et al. Prevalence of falls and associated factors in the elderly. *Rev Saude Publica.* 2007;41(5):749-56.
- Skellton DA, Kennedy J, Rutherford OM. Explosive power and asymmetry in leg muscle function in frequent fallers and non-fallers aged over 65. *Age Ageing.* 2002;31(2):119-25.
- Vellas BJ, Wayne SJ, Romero LJ, Baumgartner RN, Garry PJ. Fear of falling and restriction of mobility in elderly fallers. *Age Ageing.* 1997;26(3):189-93.
- WHO. Falls. 2010. Available from: <http://www.who.int/mediacentre/factsheets/fs344/en/>.
- WHO. What are the public health implications of global ageing? 2006.
- WHO. WHO Global Report on Falls Prevention in Older Age. 2007.
- Wolfson L, Judge J, Whipple R, King M. Strength is a major factor in balance, gait, and the occurrence of falls. *J Gerontol A Biol Sci Med Sci.* 1995;50:4-7.