Ficha de unidade curricular

1. Designação da Unidade Curricular

Laboratorial Methods I: Atividade física e regulação cardiovascular

2. Docente responsável (preencher o nome completo)

Maria **Helena Santa-Clara** Pombo Rodrigues

3. Carga letiva na unidade curricular do docente responsável

Teóricas T	Teórico-práticas TP	Prático-laboratoriais PL	Trabalho de campo TC	Seminário S	Estágio E	Orientação Tutorial OT	Outra O
-	5	-	-	-	-	-	-

4. Outros docentes e respetivas cargas letivas na unidade curricular

Pedro **Xavier Melo** Fernandes Castanheira

Teóricas T	Teórico-práticas TP	Prático-laboratoriais PL	Trabalho de campo TC	Seminário S	Estágio E	Orientação Tutorial OT	Outra O
-	-	5	-	-	-	-	-

5. Objetivos de aprendizagem (conhecimentos, aptidões e competências a desenvolver pelos estudantes)

The phenomenon of exercise-induced changes of arterial stiffness is a largely understudied field of clinical significance, especially in adults with cardiovascular disease in which arterial stiffness plays an important role, but also in children and adolescents, once considered to be at low risk, but with the growing health concerns related to sedentary lifestyle, poor diet and obesity, vascular screening may be needed earlier so that interventions to improve cardiovascular health can be initiated. Although arterial stiffness has been used in intervention trials evaluating the salutary effect of drugs [1, 2], dietary supplementation [3-5] and lifestyle modifications [6, 7] in children and adults, until recently researchers have scarcely used arterial stiffness to examine the role of a single bout of exercise on the arterial tree. It is possible that the effects of a bout of exercise can predict the effects of chronic exercise (accumulation of single bouts of exercise over time), as is the case in several variables, blood pressure reduction being a prime example [8].

The acute exercise model can be useful in investigating mechanisms of the exercise (acute or chronic) response [9]. Although the number of investigations reporting arterial stiffness following exercise is limited even in adults, the purpose for the study of post-exercise arterial stiffness and the diversity of the populations studied are not. Oxidative stress [10], arterial response to acute exercise [11], postprandial arterial stiffness [12], systemic and regional hemodynamics [13], smoke exposure [14] and muscle ischemia [15] have been the focus of studies utilizing arterial stiffness in the acute model.

Utilizing the acute exercise model can be advantageous as it allows for an efficient manipulation of exercise variables (i.e. mode, intensity, duration, etc.) and permits greater experimental control of confounding variables. Incremental exercise to exhaustion [11, 16-18], moderate intensity continuous exercise [19, 20], brief low intensity exercise [21, 22] and supramaximal exercise [23, 24] are some of the varying protocols used to examine changes in central and peripheral arterial distensibility measurements conducted at discrete time points ranging from 2 min [23] to 240 min [19] following exercise. In addition, it is also possible to unmask vascular abnormalities that are not present at rest using acute physical stress [14].

The purpose is to overview methodological and physiological factors pertinent to changes in arterial elastic properties in the context of acute exercise.

By the end of the seminars students should be able to: 1) Identify several carotid and aortic stiffness indices; 2) Identify submaximal and maximal gas exchange parameters during an exercise test on the treadmill; 3) Identify basic concerns warranted attention when interpreting stiffness following acute exercise; and 4) Draw an experimental design on the acute effects of exercise in carotid and aortic artery stiffness indices and central blood pressure.

6. Conteúdos programáticos:

A conceptual framework for performance diagnosis and training prescription from submaximal and maximal gas exchange parameters--theory and application
To give an applicable framework for the evaluation of maximal endurance capacity as well as for the derivation of exercise prescription by the use of gas exchange thresholds.

Scientific rationale for evaluating changes in arterial elastic properties in response to acute exercise. Methodology for employing arterial stiffness indices as outcome measures in the acute exercise model. Concerns warranted attention when interpreting stiffness following acute exercise.

7. Demonstração da coerência dos conteúdos programáticos com os objetivos da unidade curricular

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8. Metodologias de ensino (avaliação incluída)

Semi-directive teaching methods will be used.

Evaluation consists on the drawing of an innovative research plan that should respect the following items:

- Introduction
- Purpose
- Methodology
    - Participants
        - Exclusion criteria should be added
    - Study Design
    - Descriptive methods for each variable to assess
    - References

The research plan should:

- Be submitted in word file format to santaclara@fmh.ulisboa.pt
- Use standard software tools for publishing and managing bibliographies, citations and references. Numbered output style should be elected for citations.
- Use a page setup in portrait orientation, with 3 cm top and bottom margins and 2.5 cm side margins
- Not exceed 3 A4 pages

9. Demonstração da coerência das metodologias de ensino com os objetivos de aprendizagem da unidade curricular

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10. Bibliografia

1. Haller, M.J., et al., Pediatric Atorvastatin in Diabetes Trial (PADIT): a pilot study to determine the effect of atorvastatin on arterial stiffness and endothelial function in children with type 1 diabetes mellitus. J Pediatr Endocrinol Metab, 2009. 22(1): p. 65-8.
2. Choi, Y., et al., Acute effect of high-intensity eccentric exercise on vascular endothelial function in young men. J Strength Cond Res, 2014.
3. Ayer, J.G., et al., Dietary supplementation with n-3 polyunsaturated fatty acids in early childhood: effects on blood pressure and arterial structure and function at age 8 y. Am J Clin Nutr, 2009. 90(2): p. 438-46.
4. Eskurza, I., et al., Ascorbic acid does not affect large elastic artery compliance or central blood pressure in young and older men. Am J Physiol Heart Circ Physiol, 2004. 286(4): p. H1528-34.
5. Pilz, S., et al., Effects of vitamin D on blood pressure and cardiovascular risk factors: a randomized controlled trial. Hypertension, 2015. 65(6): p. 1195-201.
6. Abu-Kishk, I., et al., Lifestyle modifications in an adolescent dormitory: a clinical trial. Korean J Pediatr, 2014. 57(12): p. 520-5.
7. Maeda, S., et al., Lifestyle modification decreases arterial stiffness and plasma asymmetric dimethylarginine level in overweight and obese men. Coron Artery Dis, 2013. 24(7): p. 583-8.
8. Thompson, P.D., et al., The acute versus the chronic response to exercise. Med Sci Sports Exerc, 2001. 33(6 Suppl): p. S438-45; discussion S452-3.
9. Padilla, J., R.A. Harris, and J.P. Wallace, Can the measurement of brachial artery flow-mediated dilation be applied to the acute exercise model? Cardiovasc Ultrasound, 2007. 5: p. 45.
10. McClean, C.M., et al., The impact of acute moderate intensity exercise on arterial regional stiffness, lipid peroxidation, and antioxidant status in healthy males. Res Sports Med, 2011. 19(1): p. 1-13.
11. Ranadive, S.M., et al., Comparison of the acute impact of maximal arm and leg aerobic exercise on arterial stiffness. Eur J Appl Physiol, 2012. 112(7): p. 2631-5.
12. Augustine, J., et al., Effect of a single bout of resistance exercise on arterial stiffness following a high-fat meal. Int J Sports Med, 2014. 35(11): p. 894-9.
13. Madden, K.M., et al., Short-term aerobic exercise reduces arterial stiffness in older adults with type 2 diabetes, hypertension, and hypercholesterolemia. Diabetes Care, 2009. 32(8): p. 1531-5.
14. Doonan, R.J., et al., Altered arterial stiffness and subendocardial viability ratio in young healthy light smokers after acute exercise. PLoS One, 2011. 6(10): p. e26151.
15. Figueroa, A., R. Gil, and M.A. Sanchez-Gonzalez, Whole-body vibration attenuates the increase in leg arterial stiffness and aortic systolic blood pressure during post-exercise muscle ischemia. Eur J Appl Physiol, 2011. 111(7): p. 1261-8.
16. Naka, K.K., et al., Arterial distensibility: acute changes following dynamic exercise in normal subjects. Am J Physiol Heart Circ Physiol, 2003. 284(3): p. H970-8.
17. Heffernan, K.S., et al., Arterial stiffness and baroreflex sensitivity following bouts of aerobic and resistance exercise. Int J Sports Med, 2007. 28(3): p. 197-203.
18. Yan, H., et al., Hemodynamic and arterial stiffness differences between African-Americans and Caucasians after maximal exercise. Am J Physiol Heart Circ Physiol, 2014. 306(1): p. H60-8.
19. Mc Clean, C.M., et al., The effect of acute aerobic exercise on pulse wave velocity and oxidative stress following postprandial hypertriglyceridemia in healthy men. Eur J Appl Physiol, 2007. 100(2): p. 225-34.
20. Kingwell, B.A., et al., Arterial compliance increases after moderate-intensity cycling. Am J Physiol, 1997. 273(5 Pt 2): p. H2186-91.
21. Sugawara, J., et al., The effects of low-intensity single-leg exercise on regional arterial stiffness. Jpn J Physiol, 2003.

53(3): p. 239-41.
22. Sugawara, J., et al., Effects of nitric oxide synthase inhibitor on decrease in peripheral arterial stiffness with acute low-intensity aerobic exercise. Am J Physiol Heart Circ Physiol, 2004. 287(6): p. H2666-9.
23. Rakobowchuk, M., et al., Effect of acute sprint interval exercise on central and peripheral artery distensibility in young healthy males. Eur J Appl Physiol, 2009. 105(5): p. 787-95.
24. Rossow, L., et al., Acute effects of supramaximal exercise on carotid artery compliance and pulse pressure in young men and women. Eur J Appl Physiol, 2010. 110(4): p. 729-37.