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Editorial Open Access

Exercise for Cardiovascular Integrity and Plasticity During Ageing

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Editorial

Cardio asc lar d sf nction together ith ario s t pes of heart problems is associated ith the ageing process since both impair cardiac f nction and the a cted indi id al's q alit -of-life ith the e ent al c rtailment of the life-e pectanc of elderl ageing citi ens. S stematic literat re re ie s and meta-anal ses ha e re ealed that the potential of socio-c lt ral determinants of e ercise and diets for health manifestations are identi able [1]. e impact of ol ntar e ercise pon a mo se model of non-ischemic dilated cardiom opath as e idenced b an impro ed o tcome in non-ischemic dilated heart fail re [2]. In a rat model of ageing, lo -intensit aerobic e ercise along ith limb blood- o restriction ma ameiorate ageing-ind ced m scle atroph and nicotinic acet lcholine receptors at the ne rom sc lar j nction [3]. It as obser ed that the restriction of blood- o concomitant ith a mild e ercise regime prod ced potentiall ameliorai e e ects in the protection and a gmention of m scle mass and nicotinic acet lcholine receptors cl stering at the ne rom sc lar j nction among older rats. Among older omen, strength e ercise training sched les ere bene cial, both for a s stained lifespan and against mortalit , if maintained at moderate le el of e ercise d ration, independent of the t pe or le el of aerobic e ercise. Among middle-aged or older indi id als ho presented lo er aortic sti ness, itho t h pertension, habit al bo ts of aerobic e ercise o ered straightfor ard bene ts, as estimated thro gh se of carotid-femoral p lse a e elocit [4-6]. Ne ertheless, the e tent of aortic sti ness as obse ed to be resilient against the in ence of clinicall -rele ant a gmentatioon of responses to habit al aerobic e ercise hen placed in combination ith the h pertension displa ed b middle-aged and older ad lts [7], thereb prmoting a form of ph siological resilience. In this regard, in obser ations of older men both the participation in stren o s e ercise and the grad al increments of alking-speed that these s bjects performed ere associated ith red ctions in all-ca se mortalit and also in speci c mortalit , s ch as cardio asc lar disease and heart problems [8]. In a cohort of race-ethnicall di ersi ed older female participants (mean age=78.9 ears), a er adj stment as made for age, earag time, race-ethnicit , and other potential confo nding ariables, ph sical e ercise/acti it parameters, as assessed thro gh accelerometr , ere associated pro tabl ith mean le els of high-densit lipoproteins, trigl cerides, gl cose, C-reacti e protein, bod mass inde , aist girth, and the Re nolds Risk Score [9]. e e ercise ind ced enhancement of the transcription factor, n clear er throid-2-p45-related factor-2, that reg lates se eral antio idant a ecting genes to co nteract o idati e damage in se eral organs, incl ding heart and brain has been obser ed also [10].

e age-dependent decline in the f nction of cardio asc lar tiss es initiates e ent all the retardations in cerebral blood o reg lation and maintenance, hich in t rn, leads to a senscent cascade that c lminates in the impairment of ne ronal micro-en ironmental homeostasis. Conc rrentl , the e tremel high le el of metabolic acti it of the brain and CNS combined ith limited capabilities intracell lar energ storage places critical demands pon the logistics of cerebral blood o to maintain adeq atel f nctioning ne ronal metabolism. In both Al heimer's disease and normal-ad anced le el ageing, cerebral h poperf sion, increased cerebral blood- o p lsatilit and d sreg lation of blood press re control d ring orthostatic ha e been fo nd to be harbingers of e aggerated, age-related deterioration in both cerebro asc lar and cardio asc lar f nction ith highest le els of all-ca se mortalit Ha ard risk occ rring among those indi id als presenting limitations of both ph sical mobilit and cognition as opposed to mobilit onl , cognition onl , or no limitation. Altho gh there remains a ailable a great ariation of e ercise programs, e.g. in the case of cardio asc lar lnerabilities, remarkabl analogo s bene ts and parameters ma be e pressed, independent of program details, s ch as the high-intensit inter al aerobic training that as gi en to a gro p of elderl Japanese men (aged 60-69 ears) prod ced eq i alent le els of feasibilit , e ercise tolerance and percei ed e ertion as a traditional moderate-intensit contin o s aerobic training. In a pop lation of elderl T rkish citi ens (n = 2976) displa ing coronar heart disease, it as obser ed, as a matter of concern, that o er 75% ere sedentar and 63% ere either o er eight or obese. It has been sho n that brachial shear rate patterns, that a ect the endotheli m as ell as the de elopment and progression of atherosclerosis, and brachial arter intima-media thickness bear relationships to ad ancing age. Among one h ndred-and-t o middle-aged and older indi id als, ho ere separated into e ercise and control gro ps, ho ere s bmitted to a 12- eek inter al of aerobic e ercise, that the e ercise sched le a gmented the antegrade shear rate and decreased the retrograde shear rate and brachial arter intima-media thickness. At the same time, the alterations obser ed in the and lo -densit -lipid cholesterol, onc rrent ith an increase in aerobic capacit , itho t an hanges among the control s bjects. is pattern of res lts entails that heart-rate targeted aerobic e ercise ameliorates aortic sti ness and impro ement of metabolic and tness parameters. Finall , in elderl male patients presenting essential h pertension, both conc rrent e ercise, these are programs that attempt to concomitantl de elop resistance-to-fatig e (thro gh end rance-based e ercise) and increased m scle mass (thro gh resistance-based e ercise), and aerobic e ercise ind ced post-e ercise h potension altho gh this e ect as

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longer lasting for the aerobic e ercise.

ere is an e er-increasing necessit to deri e lifest le strategies and related ne robiological mechanisms/tactics for the red ction of ageing-related motor, mood-de cit and cogniti e impairments as ell as for the ad ancement of plasticit among the aged. s, it has been obser ed that aerobic e ercise co ld red ce age related decline in cognition and brain f nctioning. A lifelong adherence to the minim m recommended ph sical e ercise bears a strong relationship ith markers of cogniti e f nction and biomarkers of performance as ell as ne ronal integrit as the ageing process contin es [11]. In the laborator animal model of Bro n-Nor a /Fischer 344 F1 h brid rats, e pressions of locomotor acti it start to deteriorate alread d ring middle age (age le el: 12-18 months), accompanied b red ced e pression of the glial-deri ed ne rotropic factor famil receptor, GFR -1, hich is red ced in s bstantia nigra [12]. Moderate le els of e ercise that ere initiated at 18 months of age, implemented the nigral GFR -1 and t rosine h dro lase e pression no later than 2 months a er ards. Among the aged rats, the replenishment of ageing-related loss of GFR -1 in the s bstanta nigra enhanced t rosine h dro lase le els in the s bstantia nigra alone as ell as locomotor acti it Moderate le els of e ercise-regimens ere ten initiated among a sedentar gro p of male Bro n-Nor a /Fischer 344 F1 h brid rats as a longit dinal e ort to e al ate hether or not e ercise o ld ameliorate the ageing-related motor deterioration hich initiated at t o di erent age-le els d ring the later stages of the lifespan (i.e., 18 or 24 months of age). It as obser ed that the motor deterioration as re ersed among the 18-month, b t not 24-montltgs7 (t)6 g-0.02 T T (o)12 (9 (o)-8.9 (de(o)1( )8 (er)6 (s)-8.b9(ra a)-))9 (m)4 T TX(s7 ( )-34 (o)1)ffmng tertt1(l)-g(t)-cr1gtgt(o