MEDIATOR EFFECT OF CARDIORESPIRATORY FITNESS ON THE RELATIONSHIP BETWEEN ARTERIAL STIFFNESS AND COGNITIVE FUNCTION

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BACKGROUND

CVD risk factors

Arterial Stiffness

Cognitive Impairment

Dementia

Hypertension 2008, 52:1120
Brain 2011, 134:3398
J Hypertens 2011, 29:1469
CARDIORESPIRATORY FITNESS: is the ability of the circulatory and respiratory systems to supply oxygen to skeletal muscles during sustained physical exercise

Public Health Rep 1985, 100: 126

Independent predictor for all cause mortality and cardiovascular events

Jama 2009, 301: 202

Negative association between arterial stiffness and cardiorespiratory fitness

J Human Hyper2010, 24: 197; JCH 2016, 18:292

Positive association between cognitive function and cardiorespiratory fitness

BACKGROUND

CARDIOPULMONARY RESPIRATORY FITNESS
To investigate the role of cardiorespiratory fitness as a mediator of the relationship between arterial stiffness and cognitive function in apparently healthy seniors
Study Design

- Cross-sectional

- 155 participants (75.5 ± 6.5 yrs)

- Daily-care institutions and senior physical activity programs from Porto – Portugal
## METHODS

### Ethics

**Ethics Committee of Faculty of Sports, University of Porto (02.2018)**

**Procedures according to Helsinki declaration**

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<th>Inclusion Criteria</th>
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<tr>
<td>Age ≥ 65 years old</td>
<td>Established diagnosis of cardiovascular disease or cognitive disorders, orthopaedic impairments, arrhythmias, severe hypertension, acute coronary syndrome, pulmonary and renal comorbidities, and peripheral arterial disease</td>
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Cardiorespiratory Fitness

- 6 minute-walk test: submaximal exercise test

Arterial Stiffness

- Carotid-femoral pulse wave velocity (c-f PWV)
- Applanation tonometry (SphygmoCor, AtCor Medical, Australia)
- Direct distance, 2 measurements (mean), c-f PWV x 0.8
Cognitive Function

- Portuguese validated version of the Montreal Cognitive Assessment (MoCA)

- Cognitive domains: Executive functions, language, visuospatial skills, short term memory, attention, concentration and working memory, spatial and temporal orientation

- Maximum score: 30 points

- 1 additional point for subjects with 12 or less years of education
Statistical Procedures

- Descriptive statistics (mean \( \pm \) sd; frequencies)
- Between genders comparisons (t-test, chi-square test, Mann-Whitney)
- Bivariate correlation (cfPWV, MoCA and 6 min-walk test)
- Simple mediation analysis:
  - 1 dependent, 1 independent and 1 potential mediator
  - Bootstrapping procedures (direct, indirect and total effect)
  - Hayes’s PROCESS macro for SPSS
# RESULTS - Sample Characteristics

| Physical Characteristics, mean ± sd | Total (N=155) | Female (N=108) | Male (N=47) | p  
|-------------------------------------|---------------|----------------|-------------|-----
| Age (years)                        | 75.5 ± 6.5    | 75.8 ± 6.6     | 74.8 ± 6.5  | .384
| Body mass index (kg/m²)            | 27.6 ± 4.4    | 27.5 ± 4.6     | 27.7 ± 4.0  | .873
| Waist circumference (cm)           | 94.6 ± 13.8   | 91.2 ± 11.9    | 102.3 ± 14.8| <.001
| Hip circumference (cm)             | 103.2 ± 14.8  | 101.9 ± 10.2   | 106.3 ± 21.8| .781

| Education, % (N)                   |               |               |             | .014
|------------------------------------|---------------|----------------|-------------|-----
| Primary and elementary education   | 69 (107)      | 74 (80)        | 57.4 (27)   |     
| Secondary school                   | 18.7 (29)     | 13 (14)        | 31.8 (15)   |     
| Higher education                   | 12.3 (19)     | 13 (14)        | 10.6 (5)    |     

| Hemodynamics, mean ± sd            |               |               |             |     
|------------------------------------|---------------|----------------|-------------|-----
| SBP (mmHg)                         | 128.1 ± 17.1  | 127.4 ± 19.0   | 129.7 ± 11.9| .367
| DBP (mmHg)                         | 67.7 ± 9.0    | 66.3 ± 9.8     | 70.8 ± 6.1  | .001
| Mean Arterial Pressure (mmHg)      | 88.9 ± 11.7   | 88.2 ± 13.2    | 90.6 ± 7.5  | .143
| Resting Heart Rate (bpm)           | 63.5 ± 9.9    | 65.4 ± 9.5     | 59.3 ± 9.3  | <.001
| c-f PWV (m/s)                      | 11.5 ± 3.1    | 11.7 ± 3.3     | 11.0 ± 2.6  | .199

| Cardiorespiratory fitness, mean ± sd|               |               |             |     
|-------------------------------------|---------------|----------------|-------------|-----
| 6 min-walk test (m)                 | 471.3 ± 161.7 | 438.2 ± 159.5  | 545.2 ± 142.2| <.001

| Cognitive Function, mean ± sd       |               |               |             |     
|-------------------------------------|---------------|----------------|-------------|-----
| MoCA (score)                        | 20.0 ± 6.3    | 19.2 ± 6.7     | 22.0 ± 4.7  | .004
RESULTS - Mediation Analysis

**Unadjusted mediation model**

Unpublished data

**INDIRECT EFFECT** = **-0.516 (95% CI: -0.773; -0.305)**

Unpublished data
RESULTS - Mediation Analysis

**Total Effect**
- $\beta = -0.304$  
  ($p = 0.068$)

**Direct Effect**
- $\beta = 0.076$  
  ($p = 0.634$)

**INDIRECT EFFECT**
- $-0.229$  
  (95% CI: $-0.449$; $-0.048$)

Adjustments for gender and age

Unpublished data
Cardiorespiratory fitness, independently of gender and age, has a mediator capacity in the association between arterial stiffness and cognitive function.

Exercise programs aiming to improve cardiorespiratory fitness might positively affect the association between arterial stiffness and cognition function.
Non-randomized cross sectional study

Small sample size

Physical activity was not controlled
THANK YOU

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