Cardiorespiratory Fitness and Vascular Health in Youth

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Insight

Introduction

CVD refers to disease of the heart and blood vessels and is the leading cause of mortality in Ireland. CVD Begins in childhood and adolescence due primarily to exposure to lifestyle mediated risk factors . Endothelail dysfunction, induced by CVD risk factors, is one of the earliest events in the development of CVD and precedes structural changes in the artery walll such as intima media thickness. Exercise training has been shown to restrore endothelial function (EF), decrease carotid intima media thickness (cIMT) and improve CV risk profile in obese children. There is currently no research that has examined subclinical atherosclerotic CVD in asympomatic adolescents with low and high cardiorepsiratory fitness (CRF). This study compared CVD risk factors, cIMT and EF in adolescent boys with low and high CRF and examined the relation between CRF and cIMT and CRF and FMD in asympomatic adolescent boys. It was hypothesised that boys with a high CRF would have a healthier CV profile and that there would be an inverse relation between CRF and cIMT and CRF and EF.

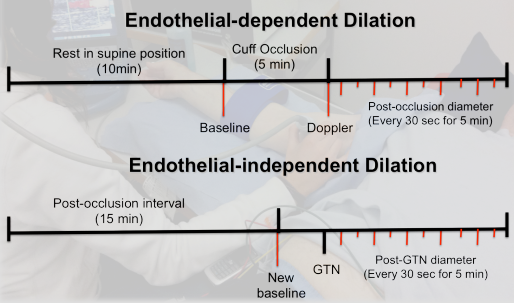## Methods

Experimental Design

School Visit
n=228

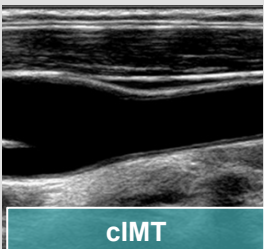Laboratory Visit
n=23

20 MSST + Heart Rate

9 Low CRF

14 High CRF

Random Selection

Endothelial Function

Endothelial-dependent Dilation

Rest in supine position (10min)

Cuff Occlusion (5 min)

Baseline

Doppler

Post-occlusion diameter (Every 30 sec for 5 min)

Endothelial-independent Dilation

Post-occlusion interval (15 min)

New baseline

GTN

Post-GTN diameter (Every 30 sec for 5 min)

Total Cholesterol
LDL-C
HDL-C
Non HDL-C
Triglycerides
Glucose

Blood Markers

cIMT

Body Composition

VO$_{2max}$
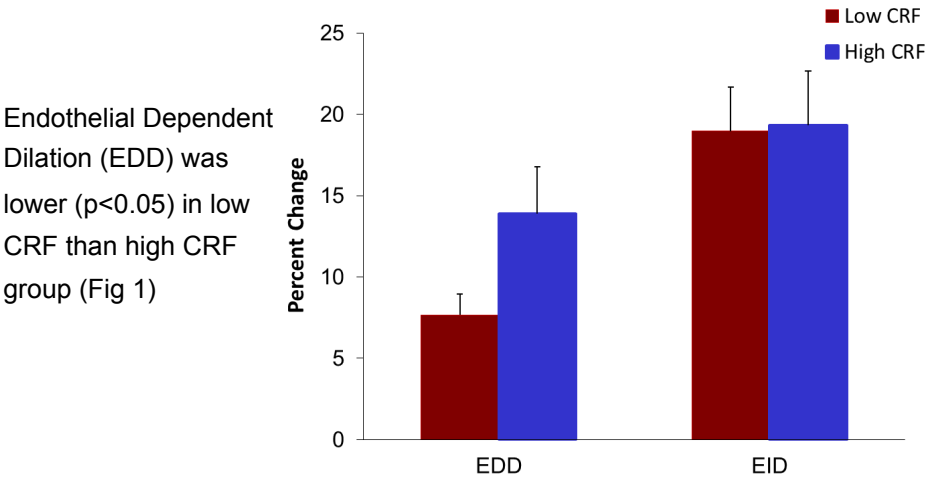
Results

The table summarises the physiological, blood pressure, CRF, serum lipids, glucose and cIMT results

	Low CRF	High CRF	p value
Age (yr.)	15.89 ± 0.60	15.86 ± 0.37	0.875
Height (cm)	180.43 ± 5.03	174.09 ± 4.78	0.006
Mass (kg)	90.03 ± 16.27	62.86 ± 5.07	0.001
BMI (kg·m^2)	27.68 ± 5.02	20.74 ± 1.49	0.003
Body fat (%)	26.80 ± 8.88	7.92 ± 2.07	0.000
SBP (mm/Hg)	136.44 ± 8.80	111.86 ± 6.06	0.000
DBP (mm/Hg)	82.44 ± 5.46	75.07 ± 5.00	0.003
VO$_2$max (ml·kg^{-1}min^{-1})	40.53 ± 1.77	63.96 ± 3.94	0.000
Triglycerides (mg·dL^{-1})	117.90 ± 54.32	51.71 ± 20.36	0.006
Total cholesterol (mg·dL^{-1})	154.57 ± 25.01	139.84 ± 33.15	0.268
LDL-C (mg·dL^{-1})	99.63 ± 21.20	82.30 ± 24.23	0.094
HDL-C (mg·dL^{-1})	39.07 ± 6.69	46.57 ± 12.57	0.116
Non HDL-C(mg·dL^{-1})	115.50 ± 22.25	93.27 ± 26.49	0.050
Glucose (mmol·L^{-1})	4.53 ± 0.41	4.21 ± 0.28	0.048
Right CCA cIMT (cm)	0.06 ± 0.01	0.04 ± 0.00	0.000
Left CCA cIMT (cm)	0.05 ± 0.01	0.04 ± 0.00	0.001

Endothelial Dependent Dilation (EDD) was lower (p<0.05) in low CRF than high CRF group (Fig 1)

Figure 1. Percentage change in EDD and EID in the low CRF and high CRF group

There was a positive relation between EDD and VO$_{2max}$ (Fig 2)

(r=0.86; p<0.001)
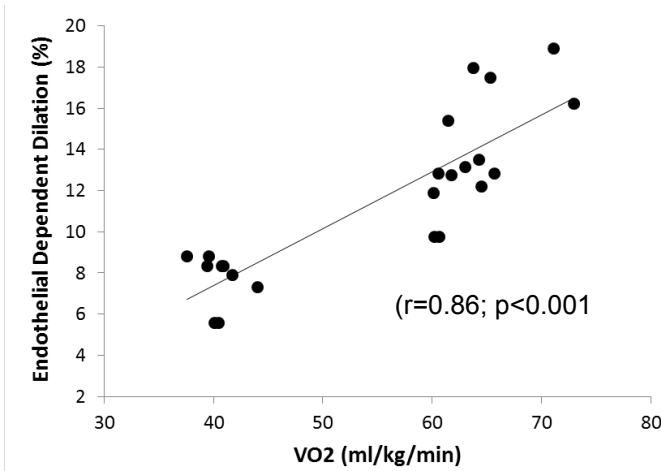
Figure 2. Relation between EDD and VO$_{2max}$

Right and left cIMT was significantly higher in the low CRF than the high CRF group. There was a significant relation between VO$_{2max}$ and near (r=0.65; p<0.001) and far (r=-0.77p<0.001) and far (r=-0.74; p<0.001) left wall cIMT.