Legacy Effects of STRRIDE Exercise Training Programs on Cardiometabolic Health Observed Ten Years Later

AHA Epi-Lifestyle Medicine
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➢ No Conflicts to Disclose
STRRIDE: Eligibility Criteria

Age: 40 - 65
Body Composition: 25 ≤ BMI ≤ 35
Lipids: 130 ≤ LDL ≤ 190 or HDL ≤ 40 M and ≤ 45 W
Glucose: fasting ≤ 140 mg%; fasting insulin ≥ 10 IU/ml
Blood pressure: ≤ 160/90 mmHg
Menstrual status: postmenopausal (FSH ≥ 40) ± HRT ≥ 6 months
Demographics: equal genders, 30% minority
Activity: sedentary, peak VO$_2$ ≤ 40 ml/kg/min (11 METS)
Medications: nothing that is known to influence skeletal muscle or exercise training responses (e.g. ACE inhibitors, β-blockers) and stable for 6 months
## STRRIDE - Training Protocols

<table>
<thead>
<tr>
<th>Intensity</th>
<th>Amount</th>
<th>Time/wk</th>
</tr>
</thead>
<tbody>
<tr>
<td>(peak VO$_2$)</td>
<td>(kcal/wk)</td>
<td>(min per wk)</td>
</tr>
<tr>
<td>Brisk Walking</td>
<td>13 miles/week</td>
<td>170</td>
</tr>
<tr>
<td>Jogging</td>
<td>13 miles/week</td>
<td>120</td>
</tr>
<tr>
<td>Jogging</td>
<td>22 miles/week</td>
<td>170</td>
</tr>
<tr>
<td>Inactive</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>
STRRIIDE - Study Design

- Months 0
- 3
- 6
- 9
- 10
- 12

Screening

Ramp up

Training

Detraining

Retraining (optional)
Percent Change Peak VO₂

Group

Inactive  Low Dose Moderate  Low Dose Vigorous  High Dose Vigorous

* *
Triglycerides (mg/dl)

- Inactive Low Dose
- Moderate
- Low Dose Vigorous
- High Dose Vigorous

Percent Change Si

**Group**

- Inactive
- Low Dose Moderate
- Low Dose Vigorous
- High Dose Vigorous
Reunion Protocol

• STRRIDE I participants that finished intervention period—drop outs not invited back.

• 10 years following completion invited back for CPX test, blood work, assessment of BP, lipids, FBG, FI, waist circumference and weight, PA in last three months.

• Comparisons made to pre-intervention assessments.
Reunion Results

- **% $\Delta$ Peak VO\textsubscript{2} (L/min)**
  - Inactive
  - Low Amount Moderate
  - Low Amount Vigorous
  - High Amount Vigorous

- **$\Delta$ Mean Arterial BP (mmHg)**
  - Inactive
  - Low Amount Moderate
  - Low Amount Vigorous
  - High Amount Vigorous

- **$\Delta$ Fasting Insulin (uU/mL)**
  - Inactive
  - Low Amount Moderate
  - Low Amount Vigorous
  - High Amount Vigorous

- **$\Delta$ Minimal Waist (cm)**
  - Inactive
  - Low Amount Moderate
  - Low Amount Vigorous
  - High Amount Vigorous

*Indicates statistical significance.
PA at 10 Years

Exercise Sessions/Week (Last 3 Months)

Inactive | LAMI | LAVI | HAVI
---|---|---|---
0 | 1 | 2 | 3 | ≥4

DUKE MOLECULAR PHYSIOLOGY INSTITUTE
PA at 10 Years

Exercise Sessions/Week (Last 3 Months)

- Inactive
- LAMI
- LAVI
- HAVI

Exercise Sessions/Week Categories:
- 0
- 1
- 2
- 3
- ≥4

No
Yes

Duke Molecular Physiology Institute
Change MAP controlled PA

△ MAP controlled for weekly PA Last 3 Mo.

- Inactive
- Low Amount Moderate
- Low Amount Vigorous
- High Amount Vigorous

No Reg PA  Reg PA

***

*
Acknowledgements

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INTRODUCTION: STRRIDE Reunion evaluated longitudinal changes in cardiometabolic health (CMH) 10 years after completion of STRRIDE (Studies Targeting Risk Reduction Interventions through Defined Exercise). Subjects originally were randomized to one of four eight-month interventions: inactive control (IC); low amount moderate, intensity exercise (LAMI); low amount, vigorous intensity (LAVI); high amount, vigorous intensity (HAVI).

METHODS: Of Duke 153 STRRIDE graduates, 28 were lost to follow-up; 21 declined to participate in the Reunion; 104 were studied. Participants completed medical history and physical activity questionnaires; height, weight, blood pressure, waist circumference, and blood were collected; cardiorespiratory fitness was assessed on 93. We evaluated change in CMH 10 years after completion relative to assessments taken at the time of original randomization; thus, change scores reflect the original study-related changes plus those persisting over the ensuing ten years (legacy effect).

RESULTS: Several independent measures suggested group-specific legacy effects. Mean arterial pressure was lower in LAMI. This was different (P<0.05) from all other groups even after controlling for BP meds and baseline values. LAMI also had a lower fasting insulin; this was different (P<0.05) from IC. Peak VO₂ decreased 10-11% over ~11 y in IC and LAMI, but decreased < 5% in both vigorous intensity groups (LAVI, HAVI). IC increased 5.3 kg and 5 cm in waist circumference; however, none of the exercise groups changed significantly in these variables. All exercise groups maintained or improved lipids, blood pressure, body weight, fasting insulin; fasting glucose increased substantially in all groups. Physical activity was maintained more in all exercise groups over follow-up.

CONCLUSIONS: We observed group-specific legacy effects from a eight-month exercise training program. Whether this was due to maintained physical activity, it demonstrates the power and value for long-term CMH of even moderate term exercise interventions.
Absolute VO₂

% Δ Peak VO₂ (L/min)

Inactive

Low Amount Moderate

Low Amount Vigorous

High Amount Vigorous
Fasting Plasma Insulin

△ Fasting Insulin (uU/mL)

Inactive | Low Amount Moderate | Low Amount Vigorous | High Amount Vigorous

-8 -6 -4 -2 0 2 4 6 8
Minimal Waist

Inactive

Low Amount Moderate

Low Amount Vigorous

High Amount Vigorous

△ Minimal Waist (cm)
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Walking vs. Running Prospective Cohort Studies

- National Runners’ (33,060) and Walkers’ (15,945) Health Study Cohorts
- Energy expenditure quantified in METs/d
- Risk reductions in physician-diagnosed hypertension, hypercholesterolemia, diabetes and CHD over 6.2 years of follow-up
- No difference in risk reductions.

Williams PT, Thompson PD. ATVB 33: 1085-91, 2013