The Relationship between Glucose Levels and Physical Activity

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INTRODUCTION

- Elevated glucose levels can increase the risk for disease
- Physical activity behaviors are associated with glucose levels
- Limited research on young adults and their glucose levels compared to activity

OBJECTIVES

- To complete a cross sectional study and determine associations between fasting glucose with physical activity, and fitness

HYPOTHESES

- More physical activity and higher fitness will result in a lower, normalized glucose level

METHODS

- 26 Participants aged 18-25
- Measures: 6-hour fasted glucose measurement, and treadmill testing
- A GT9X accelerometer measured the participants’ 24-hours, 7 days of activity
- Glucose levels were compared to VO2 max, maximum rate of oxygen consumption, from the treadmill test and to their weekly vector magnitude and step counts to determine physical activity.
- Statistical analysis: the relationship between fitness and physical activity with blood glucose was assessed using linear regression, additionally adjusted for age, sex, and BMI

Fitness Assessment Measures

- Bruce Protocol
- Treadmill Test (ml/kg/min)

RESULTS

Table 1: Sample Descriptives

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>p-value comparing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>21.3</td>
<td>21.2</td>
<td>.835</td>
</tr>
<tr>
<td>Weight (lbs)</td>
<td>182.8</td>
<td>147.5</td>
<td>.005</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>25.7</td>
<td>24.2</td>
<td>.320</td>
</tr>
<tr>
<td>Resting blood glucose (mg/dL)</td>
<td>100.0</td>
<td>88.4</td>
<td>.041</td>
</tr>
<tr>
<td>VO2 max (ml/kg/min)</td>
<td>47.2</td>
<td>36.0</td>
<td>.007</td>
</tr>
<tr>
<td>Physical Activity (CPM)</td>
<td>2080.4</td>
<td>1922.2</td>
<td>.333</td>
</tr>
<tr>
<td>Step Count</td>
<td>11,494.5</td>
<td>11,846.2</td>
<td>.764</td>
</tr>
</tbody>
</table>

- In unadjusted models, VO2max was positively associated with blood glucose (p=0.039)
- Step count was negatively associated with blood glucose (p=0.02)
- When adjusted for age, sex, and BMI, VO2max was not statistically associated with blood glucose (p=0.668), but step count remained negatively associated

Table 2: Associations between physical activity and blood glucose unadjusted

<table>
<thead>
<tr>
<th></th>
<th>Estimate (β)</th>
<th>Standard Error</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VO2</td>
<td>0.9</td>
<td>0.4</td>
<td>0.05, 1.7</td>
<td>0.039</td>
</tr>
<tr>
<td>Physical Activity (CPM)</td>
<td>0.003</td>
<td>0.007</td>
<td>-0.01, 0.02</td>
<td>0.716</td>
</tr>
<tr>
<td>Step Count</td>
<td>-0.002</td>
<td>0.001</td>
<td>-0.004, -0.0004</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Table 3: Associations between physical activity and blood glucose adjusted for age, sex, BMI

<table>
<thead>
<tr>
<th></th>
<th>Estimate (β)</th>
<th>Standard Error</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VO2</td>
<td>0.2</td>
<td>0.5</td>
<td>-0.9, 1.3</td>
<td>0.668</td>
</tr>
<tr>
<td>Physical Activity (CPM)</td>
<td>0.01</td>
<td>0.01</td>
<td>-0.01, 0.02</td>
<td>0.434</td>
</tr>
<tr>
<td>Step Count</td>
<td>-0.002</td>
<td>0.001</td>
<td>-0.003, -0.0001</td>
<td>0.038</td>
</tr>
</tbody>
</table>

DISCUSSION

- Overall findings:
  - Higher step count → lower blood glucose
  - Higher VO2 max → higher blood glucose
- Mechanisms:
  - Relationship between fitness and physical activity with blood glucose was assessed using linear regression, additionally adjusted for age, sex, and BMI
- Limitations of study:
  - Lack of compliance with fasting from participants
  - Small population size
- Strengths of study:
  - Obtaining fasted blood samples
  - Successfully administering the fitness assessments
  - Analyzing the accelerometer data
- Future studies:
  - Monitor blood glucose levels before and after amounts of exercise

CONCLUSIONS

- Proven hypothesis of higher physical activity associated with lower blood glucose.
- Increase in weekly steps could improve overall health
- Disproved hypothesis of higher fitness associated with lower blood glucose.
- This study was important to determine associations between fasting glucose with physical activity and fitness.
- This study also helped by promoting glucose test screening to young individuals.

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