Association of Habitual Physical Activity with Home Blood Pressure: Insights from the electronic Framingham Heart Study (eFHS)

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Background

• A sedentary lifestyle is associated with increased risk for hypertension
• Prior studies that have looked at either self-reported physical activity or used accelerometers to measure daily activity for only a short amount of time.
• Smartwatches enable accurate measurement of habitual physical activity.
• We hypothesize that higher habitual physical activity is associated with lower home blood pressure.
Methods - eFHS

- 638 participants (age 55±9 years, 59% women, 10% non-white, 29% with hypertension)
- Participants wore the watch ≥5 hours per day for ≥30 days and transmitted ≥3 BP readings
Results

• Over median 280 follow-up days, participants wore the watch for 14 hours per day and sent BP readings in 24 weeks.
• Average daily step count was 7531.
• Average home systolic and diastolic BP were 122 and 76 mmHg.
Results

- Higher daily step count was associated with lower SBP and DBP (Model 1).
- With adjustment for body mass index, the association became non-significant (Model 2).

<table>
<thead>
<tr>
<th>Home BP</th>
<th>Participants</th>
<th>Model 1* (\beta ) (SE; mm Hg)</th>
<th>P-value</th>
<th>Model 2† (\beta ) (SE; mm Hg)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic BP</td>
<td>All participants</td>
<td>-0.45 (0.18)</td>
<td>0.015</td>
<td>0.09 (0.17)</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>-0.36 (0.24)</td>
<td>0.14</td>
<td>0.21 (0.21)</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>-0.62 (0.27)</td>
<td>0.02</td>
<td>-0.17 (0.26)</td>
<td>0.52</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td>All participants</td>
<td>-0.36 (0.13)</td>
<td>0.006</td>
<td>0.01 (0.12)</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>-0.40 (0.17)</td>
<td>0.02</td>
<td>-0.002 (0.14)</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>Men</td>
<td>-0.34 (0.21)</td>
<td>0.11</td>
<td>-0.02 (0.21)</td>
<td>0.91</td>
</tr>
</tbody>
</table>

*Model 1 was adjusted for age, sex, family structure, and watch wear time
†Model 2 was adjusted for model 1 covariates and body mass index.
‡\(\beta\) represents the change in BP (mmHg) for every 1,000 increase in daily steps
Conclusions

• In this community-based sample of middle-aged participants, higher habitual physical activity measured by smartwatch was associated with lower home BP
• Body mass index might mediate/account for the majority of the relationship between physical activity and home BP
• These analyses do not establish causality or directionality of association.