The ‘weekend warrior’ physical activity pattern: how little is enough?

Mark Hamer,1 Gary O’Donovan,1 I-Min Lee,2 Emmanuel Stamatakis3

The dose–response relationship between physical activity and health is of great interest to policy makers, clinicians and individuals. Several recent analyses of large-scale population data have advanced our understanding, particularly in teasing apart minimal and optimal physical activity dosage. For example, if we focus on ‘minimal’ dose, 15 min a day of moderate-intensity exercise lowered mortality in a sample of more than 400 000 adults from Taiwan.1 A recent meta-analysis of nine cohort studies revealed that undertaking some moderate to vigorous physical activity (MVPA) but less than the guidelines was associated with 22% reduction in mortality risk in older adults.2 For those fortunate to be able to be performing the ‘optimal’ levels of physical activity, an analysis of more than 600 000 adults of all ages from the USA and Europe showed that a nearly optimal threshold for longevity occurred at three to five times the physical activity recommendation (39% reduction in all-cause mortality). Note that the additional benefit over and above doses corresponding to one to two multiples of the physical activity guideline (31% reduction in all-cause mortality) was rather modest in general.1

THE ‘WEEKEND WARRIOR’ PHYSICAL ACTIVITY PATTERN—GOOD FOR HEALTH!

In a new study3 using a large sample of British adults, we aimed to explore the importance of physical activity frequency, in particular the ‘weekend warrior’ exercise pattern where people meet the MVPA recommendations in just one to two sessions per week, originally described by Lee and colleagues.4 We found that the weekend warriors and those regularly active (≥3 sessions per week reporting ≥150 min/week in moderate-intensity or ≥75 min/week in vigorous-intensity activities) had similar reduction in risk of all-cause, cardiovascular and cancer mortality.5 These finding raised a number of key discussion areas.

MINIMAL DOSAGE FOR HEALTH BENEFIT

From a public health perspective, the greatest gains can be achieved from the transition of large numbers of people from inactivity to some activity,1 3 which has partly motivated interest in identifying the minimal dosage for health benefit.1 In our study, we also identified ‘insufficiently active weekend warriors’ who reported one to two sessions per week of MVPA but did not meet the physical activity guidelines. Compared with the inactive participants, there was a 17%–34% reduction in risk (depending on outcome) in the ‘insufficiently active’ participants who reported one or two MVPA sessions per week.4 We conducted further analyses to better understand the characteristics of this group. Insufficiently active weekend warriors reported almost an hour less total physical activity volume of any intensity (2.58 vs 3.15 min/week, p<0.001), had a larger deficit in MVPA volume (4.4 vs 91 min/week, p<0.001) and higher sports participation (86% vs 63%, p=0.01) compared with the insufficiently but regularly active group. Worth noting that there were also some minor differences in vigorous physical activity between the two groups that were statistically significant but highly unlikely to be of clinical importance (12 vs 10 min/week, p<0.001). We further explored dose–response patterns in the ‘insufficiently active’ participants (table 1). There was no evidence of a dose–response pattern between total MVPA volume (in the 1–149 min/week range) and mortality (p trend=0.24), although there was a linear trend (p<0.001) when analysing total physical activity of any intensity. This suggests that some of the health benefits observed in the insufficiently active participants may be explained by non-exercise activity, such as light intensity walking.

MECHANISMS

Despite our recent encouraging findings3 for weekend warriors, there are good reasons to think that a more regular physical activity pattern (ie, active on most days of the week) might reap greater health benefits, as every sustained bout of aerobic exercise has acute physiological effects that may last for up to 24 hours.6 We therefore conducted further analysis to explore the physiology of the weekend warrior (see table 2).

In cross-sectional analyses, we observed a clear dose–response association between a range of traditional risk factors (high-density lipoprotein cholesterol, glycated haemoglobin, fibrinogen, C reactive protein, body mass index, systolic blood pressure and cardiorespiratory fitness) and MVPA. The most favourable profile was consistently observed in ‘regularly active’ participants (those meeting physical activity guidelines through ≥2 sessions per week); the weekend warrior participants demonstrated intermediate levels of risk factors. Interestingly, when we calculated cardiorespiratory fitness using a non-exercise testing method,7 only relatively small differences (B=1.00, 95% CI, 0.73 to 1.27 mL/kg/min) were observed between...
weekend warrior and regularly active participants despite using a computational method that favours the regularly active by accounting only for MVPA frequency and not volume. The weekend warriors in our study undertook a large proportion of vigorous-intensity exercise (eg, 94% participated in vigorous sports), suggesting that physical activity quality (intensity) may be more important than quantity. Vigorous-intensity exercise improves aerobic fitness more than the same amount of moderate-intensity exercise, and two bouts of vigorous-intensity exercise a week are enough to maintain aerobic fitness.

**TAKE HOME MESSAGE**
In conclusion, teasing apart the dose–response relationship between physical activity and health will help refine our public health guidelines and in doing so facilitate an ‘exercise is medicine’ approach for prescribing physical activity. Our data suggest that ‘more than one road leads to Rome’ in terms of physical activity frequency and mortality benefits, although there are perhaps still good reasons to strive for daily or nearly daily physical activity (including lower risk of musculoskeletal injury).

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**Table 2 The weekend warrior exercise pattern and biomedical risk factors**

<table>
<thead>
<tr>
<th></th>
<th>Inactivea</th>
<th>Insufficiently activeb</th>
<th>Weekend warriorc</th>
<th>Regularly actived</th>
</tr>
</thead>
<tbody>
<tr>
<td>NETCRF (mL/kg/min)</td>
<td>33.6±0.04</td>
<td>35.1±0.06*</td>
<td>36.0±0.12*</td>
<td>37.0±0.07**</td>
</tr>
<tr>
<td>Resting pulse (bpm)</td>
<td>71.0±0.08</td>
<td>69.6±0.13*</td>
<td>68.5±0.27</td>
<td>68.0±0.15*</td>
</tr>
<tr>
<td>HDL-C (mmol/L)</td>
<td>1.47±0.003</td>
<td>1.51±0.01*</td>
<td>1.55±0.01*</td>
<td>1.57±0.01*</td>
</tr>
<tr>
<td>HbA1C (%)</td>
<td>5.97±0.01</td>
<td>5.84±0.02*</td>
<td>5.79±0.03*</td>
<td>5.63±0.02*</td>
</tr>
<tr>
<td>Fibrinogen (g/L)</td>
<td>3.18±0.01</td>
<td>3.05±0.01*</td>
<td>3.02±0.02*</td>
<td>2.98±0.01*</td>
</tr>
<tr>
<td>C reactive protein‡</td>
<td>1.25±0.01</td>
<td>1.11±0.01*</td>
<td>1.09±0.02*</td>
<td>1.03±0.01*</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>27.8±0.03</td>
<td>27.2±0.04*</td>
<td>27.1±0.08*</td>
<td>26.5±0.06*</td>
</tr>
<tr>
<td>WHR</td>
<td>0.89±0.001</td>
<td>0.88±0.001*</td>
<td>0.87±0.001*</td>
<td>0.87±0.001*</td>
</tr>
<tr>
<td>Systolic BP (mm Hg)</td>
<td>137.8±0.12</td>
<td>136.3±0.20*</td>
<td>135.7±0.41*</td>
<td>134.4±0.25*</td>
</tr>
</tbody>
</table>

*Not reporting any moderate- or vigorous-intensity activities
‡C reactive protein was log transformed to normalise the distribution.
†p<0.05 in comparison to ‘inactive’.
‘p<0.05 when ‘regularly active’ compared with all other groups.
BMI, body mass index; BP, blood pressure; HbA1C, glycated haemoglobin; HDL-C, high-density lipoprotein cholesterol; NETCRF, non-exercise testing cardiorespiratory fitness (calculated using age, sex, BMI, resting pulse).

**REFERENCES**