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PHYSICAL ACTIVITY AND FITNESS MEASURES IN NEW ZEALAND: A STUDY OF VALIDATION AND CORRELATION WITH CARDIOVASCULAR RISK FACTORS

KAREN LYNN MOY

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in Population Health,

The University of Auckland, 2005
The primary aim of the study was to validate the short and long form of the recently-created NZ physical activity questionnaires (NZPAQ-SF and NZPAQ-LF, respectively) in a multi-ethnic sample in Auckland. An international physical activity questionnaire (IPAQ-long) was also validated and compared to the NZ instruments. Objective PA measures were used to create a NZ compendium of PA intensities, providing baseline data for culturally-specific PAs. Secondary aims included an examination of the relationship between PA and CRF, and their associations with cross-sectional measures of cardiovascular (CV) risk factors.

The study sample consisted of 186 apparently healthy males (n=90) and females (n=96) aged 19-86 yrs, classified as European/Other (n=60), Māori (n=61), and Pacific (n=65). Heart rate monitoring (HRM) with individual calibration was used to objectively measure the duration, frequency, and intensity of at least moderate-intensity PAs performed over 3 consecutive days. Type of PA and the context in which it was performed was simultaneously recorded by participants on daily PA logs. Correlations between HRM and self-reported levels of brisk walking, moderate-intensity, vigorous-intensity, were poor for each questionnaire, and correlations were lower for Māori and Pacific ethnic groups than for European/Other. The NZPAQ-SF (r=0.3, p<0.001) and NZPAQ-LF (r=0.3, p<0.001) performed better than the IPAQ-long (r=0.1, p=0.37). The culturally-specific list of PA intensities showed strong correlation (R²=0.68) to an internationally-accepted compendium of PA intensities, and provided baseline energy cost data for 13 PAs performed by Māori and Pacific people in NZ. CRF levels were primarily influenced by gender, ethnicity, obesity, and performing at least 15 min/day of vigorous-intensity PA, and showed stronger associations with fasting blood lipids and glucose, while PA was more strongly related to SBP and DBP.

The validated NZPAQs are acceptable for measuring population level PA prevalence in NZ adults, although accuracy is lower for Māori and Pacific people. However, the availability of a culturally-specific list of PA intensities could potentially increase the accuracy of self-reported PA by Māori and Pacific people. Results from this study highlight the importance of vigorous-intensity PA for CV health, and identifies NZ Pacific people as high risk in terms of PA, obesity, and CRF.
ACKNOWLEDGEMENTS

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<th>Description</th>
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<tbody>
<tr>
<td>ACSM</td>
<td>American College of Sports Medicine</td>
</tr>
<tr>
<td>AEE</td>
<td>activity energy expenditure</td>
</tr>
<tr>
<td>API</td>
<td>Asian and Pacific Island people</td>
</tr>
<tr>
<td>BMI</td>
<td>body mass index</td>
</tr>
<tr>
<td>BMR</td>
<td>basal metabolic rate</td>
</tr>
<tr>
<td>BP</td>
<td>blood pressure</td>
</tr>
<tr>
<td>bpm</td>
<td>beats per minute</td>
</tr>
<tr>
<td>CAL&lt;sub&gt;EE&lt;/sub&gt;</td>
<td>energy expenditure determined by calorimetry</td>
</tr>
<tr>
<td>CDC</td>
<td>Center for Disease Control</td>
</tr>
<tr>
<td>CHD</td>
<td>coronary heart disease</td>
</tr>
<tr>
<td>CI</td>
<td>confidence interval</td>
</tr>
<tr>
<td>CO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>carbon dioxide</td>
</tr>
<tr>
<td>CRF</td>
<td>cardiorespiratory fitness</td>
</tr>
<tr>
<td>CSA</td>
<td>Computer Science and Applications, Inc.</td>
</tr>
<tr>
<td>CV</td>
<td>cardiovascular</td>
</tr>
<tr>
<td>CVD</td>
<td>cardiovascular disease</td>
</tr>
<tr>
<td>DBP</td>
<td>diastolic blood pressure</td>
</tr>
<tr>
<td>DGPS</td>
<td>differential satellite global positioning system</td>
</tr>
<tr>
<td>DLW</td>
<td>doubly labeled water</td>
</tr>
<tr>
<td>DLW&lt;sub&gt;EE&lt;/sub&gt;</td>
<td>energy expenditure determined by doubly labeled water</td>
</tr>
<tr>
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<td>energy expenditure</td>
</tr>
<tr>
<td>EPAQ2</td>
<td>European Physical Activity Questionnaire (modified)</td>
</tr>
<tr>
<td>EPIC</td>
<td>European Prospective Investigation into Cancer and Nutrition</td>
</tr>
<tr>
<td>FWH</td>
<td>four-week histories</td>
</tr>
<tr>
<td>HDL</td>
<td>high density lipoprotein</td>
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<td>HR(s)</td>
<td>heart rates</td>
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<td>HRFlex</td>
<td>heart rate flex method</td>
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<td>HRFlex&lt;sub&gt;EE&lt;/sub&gt;</td>
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<tr>
<td>(%)&lt;sub&gt;HRmax&lt;/sub&gt;</td>
<td>(percentage of) maximum heart rate</td>
</tr>
<tr>
<td>HRM</td>
<td>heart rate monitoring</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<td>---------------</td>
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<tr>
<td>HRM&lt;sub&gt;EE&lt;/sub&gt;</td>
<td>energy expenditure determined by heart rate monitoring</td>
</tr>
<tr>
<td>HR&lt;sub&gt;net&lt;/sub&gt;</td>
<td>net heart rate</td>
</tr>
<tr>
<td>(%)HRR</td>
<td>(percentage of) heart rate reserve</td>
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<tr>
<td>IPAQ-long</td>
<td>International Physical Activity Questionnaire – long Form</td>
</tr>
<tr>
<td>kcal(s)</td>
<td>kilocalorie(s)</td>
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<tr>
<td>kg</td>
<td>kilogram</td>
</tr>
<tr>
<td>L</td>
<td>litres</td>
</tr>
<tr>
<td>LDL</td>
<td>low density lipoprotein</td>
</tr>
<tr>
<td>ln</td>
<td>natural log</td>
</tr>
<tr>
<td>LTPA</td>
<td>leisure-time physical activity</td>
</tr>
<tr>
<td>MET(s)</td>
<td>metabolic equivalent(s)</td>
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<tr>
<td>min(s)</td>
<td>minute(s)</td>
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<tr>
<td>ml</td>
<td>millilitres</td>
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<td>MOH</td>
<td>Ministry of Health</td>
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<td>n</td>
<td>number</td>
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<td>NCD</td>
<td>non-communicable diseases</td>
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<tr>
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<td>NZPAQs</td>
<td>New Zealand Physical Activity Questionnaires</td>
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<td>New Zealand Sport and Physical Activity Questionnaire</td>
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<td>O&lt;sub&gt;2&lt;/sub&gt;</td>
<td>oxygen</td>
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<td>PA</td>
<td>physical activity</td>
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<td>r</td>
<td>Spearman’s correlation coefficient</td>
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<tr>
<td>R&lt;sup&gt;2&lt;/sup&gt;</td>
<td>correlation coefficient squared</td>
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<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>RHR</td>
<td>resting heart rate</td>
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<tr>
<td>RMR</td>
<td>resting metabolic rate</td>
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<td>RPE</td>
<td>ratings of perceived exertion</td>
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<td>revolutions per minute</td>
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<td>SBP</td>
<td>systolic blood pressure</td>
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<td>SE</td>
<td>standard error</td>
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<td>Sedentary Death Syndrome</td>
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<td>SEE</td>
<td>standard error of the estimate</td>
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<td>United States</td>
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<tr>
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<td>oxygen consumption</td>
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<td>maximum oxygen consumption</td>
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<td>World Health Organization</td>
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<td>WPV</td>
<td>within-person variation</td>
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<td>yrs</td>
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