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**Exploring physical activity profiles of  
Māori, Pacific and European women  
from Aotearoa New Zealand:  
Implications for body composition and  
metabolic health**

A thesis presented in partial fulfilment of the requirements for  
the degree of  
Doctor of Philosophy in Nutritional Sciences  
at Massey University, Auckland, New Zealand

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# Abstract

## Background

Regular physical activity provides extensive health benefits, and is a key modifiable risk factor for chronic disease.

## Aims and objectives

The research aim was to robustly explore the physical activity profiles of Māori, Pacific and European women aged 16-45 years, living in New Zealand, to understand ethnic differences in their physical activity profiles and its consequences on body composition and metabolic health markers. Objectives were to: investigate the challenges of collecting hip-worn accelerometer data; determine ethnic differences in physical activity levels, and associated disease risk of being overweight-obese; investigate whether substituting sedentary behaviour with equal time in physical activity can predict improved health markers; examine recreational physical activity preferences to make ethnic-specific suggestions for meeting physical activity guidelines.

## Methods

Participants were 406 healthy premenopausal Māori, Pacific and European women aged 16-45 years, stratified by body composition profile and ethnicity. Physical activity data were collected using hip-worn accelerometers and Recent Physical Activity Questionnaire. Body composition was assessed using anthropometry, air displacement plethysmography and dual-energy x-ray absorptiometry. Metabolic biomarkers were measured from venous blood samples.

## Results

Accelerometer wear compliance was 86%, but discomfort (67%) and embarrassment (45%) hindered wear. European women (92.7%) returned more valid data than Māori (82.1%) or Pacific (73.0%,  $p < 0.04$ ) women. More overweight-obese European (67%) than Māori (49%) or Pacific (32%,  $p < 0.001$ ) women achieved physical activity guidelines. Achieving guidelines was strongly associated for Māori, inversely with total and regional fat percentages and clustered cardiometabolic risk score ( $p < 0.01$ ) and positively with body lean percentage ( $p = 0.21$ ), and for European women inversely with regional fat percentages and positively with body lean percentage ( $p \leq 0.036$ ). Substituting sedentary time with moderate-vigorous physical activity predicted improvements ( $p < 0.05$ ) in total (14.8%) and android (12.5%) fat percentages, BMI

(15.3%) and insulin (42.2%) for overweight-obese Māori women, and waist-to-hip ratio (6.4%) among Pacific women. Recreational physical activity preferences varied by ethnicity, possibly due to cultural/ethnic factors. Suggestions to increase physical activity were: family/whanau-based team activities for Māori women; community/church-linked games and fitness sessions for Pacific women; adding variety to existing activities for European women.

## **Conclusions**

Ethnicity played a major role in: collecting data; amounts/types of physical activity performed; implications of physical activity on health markers. Tailoring physical activity recommendations for specific ethnic groups could have major positive health implications for New Zealand women.

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## List of abbreviations

ANOVA	Analysis of variance
BF%	Body fat percentage
BMI	Body mass index
BP	Blood pressure
CCMR	Clustered cardiometabolic risk
Chol:HDL	Cholesterol to HDL-c ratio
cpm	Counts per minute
CVD	Cardiovascular disease
DALY	Disability adjusted life years
DXA	Dual-energy X-ray absorptiometry
EDTA	Ethylene diamine tetraacetic acid
EXPLORE	Examining Predictors Linking Obesity Related Elements
HbA1c	Glycosylated haemoglobin
HDL-c	High-density lipoprotein cholesterol
HH	High BMI, high BF%
HIIT	High intensity intermittent training
HOMA-IR	Homeostatic Model Assessment of Insulin Resistance
HR	Heart rate
ICC	Interclass correlation coefficient
IPAQ	International Physical Activity Questionnaire
ISAK	International Society for the Advancement of Kinanthropometry
LDL-c	Low-density lipoprotein cholesterol

ISCOLE	International Study of Childhood Obesity, Lifestyle and the Environment
MEMS	Microelectro-mechanical systems
MET	Metabolic equivalent of task
MVPA	Moderate-vigorous physical activity
MVPA10	Moderate-vigorous physical activity in bouts of 10 or more minutes
NH	Normal BMI, high BF%
NHANES	National Health and Nutrition Examination Survey
NN	Normal BMI, normal BF%
NZE	New Zealand European
NZPAQ	New Zealand Physical Activity Questionnaire
OECD	Organisation for Economic Co-operation and Development
PA	Physical activity
PAQ	Physical activity questionnaire
RPAQ	Recent Physical Activity Questionnaire
RPE	Rating of Perceived Exertion
RR	Risk ratio
SD	Standard deviation
SE	Standard error
SPSS	Statistical Package for the Social Sciences
USA	United States of America
VO <sub>2</sub>	Volume of oxygen
WC	Waist circumference
WHO	World Health Organisation
WHR	Waist-to-hip ratio