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## Levels of physical activity of a sample of 10-13 year old New Zealand children

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### Abstract

**Aims.** To determine what proportion of a sample of 10 to 13 year old New Zealand children attained the Ministry of Health's physical activity guidelines. These guidelines recommend that children accumulate a minimum of 30 minutes of moderate intensity physical activity on most, preferably all, days of the week.

**Methods.** The heart rates of sixty 10-13 year olds were monitored at one minute intervals, for twelve hours on three week days and one weekend day. For each day, the number of minutes when the subject's heart rate exceeded 139 beats per minutes (bpm) was determined. The proportion of subjects who accumulated at least 30 minutes of heart rates > 139 bpm on three of the four recording days was determined. These subjects were deemed to have met the physical activity guidelines.

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**Results.** 53% of subjects met the minimum physical activity guidelines. Boys spent significantly more of their time with their heart rates elevated above 139 bpm than girls. There was no significant difference between the number of children achieving the recommended guidelines and their school's decile ranking.

**Conclusion.** There are indications that children's lives are becoming more sedentary due in part to the popularity of passive forms of leisure and the reduced incidence of active forms of transportation like walking or cycling to school. The low proportion of New Zealand children meeting the minimum physical activity guidelines is a cause for great concern.

The Surgeon General's (1996) report on Physical Activity and Health recommended that in order to gain health benefits, people of all ages should accumulate at least thirty minutes of moderate intensity physical activity on most days of the week.<sup>1</sup>

This recommendation was endorsed by the New Zealand Physical Activity Taskforce<sup>2</sup> and was embodied in the Physical Activity Policy Statement by the Ministers of Sport Fitness and Leisure, and Health.<sup>3</sup> For children, the New Zealand recommendation<sup>4</sup> is for them to accumulate 30-60 minutes of moderate intensity physical activity per day. This compares with English guidelines for all children to accumulate one hour of moderate intensity physical activity per day.<sup>5</sup> Physical activity for children includes active recreation (eg informal play, dance, sport and games), active transportation (eg walking and cycling to school), and activity during paid or domestic work (eg paper rounds and lawn mowing).<sup>6</sup>

There is strong epidemiological evidence from longitudinal cohort studies of a positive relationship between regular physical activity and health in adulthood.<sup>7</sup> Sedentary lifestyles increase the risk of coronary heart disease, non-insulin dependent diabetes, stroke and cancer of the colon; whereas active lifestyles ameliorate the risk of high blood pressure, obesity and osteoporosis.<sup>8</sup> The relationship between the health of children and adolescents and their physical activity levels is less well understood.<sup>9</sup> Appropriate physical activity appears to reduce blood pressure in hypertensive adolescents<sup>9</sup> and help reduce percent body fat in obese individuals.<sup>10</sup> In this regard it is of interest to note that the proportion of overweight and obese New Zealand children appears to be rising.<sup>11</sup> Psychological<sup>12</sup> and social<sup>13</sup> benefits appear to be associated with an active lifestyle, with researchers reporting increased self esteem and reduced levels of stress, anxiety and depression with increased involvement in active leisure. Physical activity in adolescence involving weight bearing, has positive influences on bone mineral density into adulthood.<sup>14</sup> A study of 138 fifteen to seventeen year old New Zealand females has revealed a positive correlation between physical activity levels and bone mineral density in the femur.<sup>15</sup>

The aim of the present study was to determine what proportion of a sample of 10-13 year old New Zealand children comply with the physical activity guidelines.

### Methods

Three schools from the region encompassing Christchurch and its district were chosen to represent high, middle and low socio-economic areas, decile 10, 5 and 2 respectively based on the Ministry of Education's school ratings.

Following ethical approval from the Lincoln University Human Ethics Committee, permission to undertake the study was obtained from the principal and the Board of Trustees of each of the three schools.

60 children, twenty from each of the three schools (10 boys and 10 girls), were randomly selected from those who had given informed consent. Consent was also obtained from the children's parents or guardians. Two children withdrew from the study and replacements were randomly selected from the pool of volunteers. The methodology to assess physical activity mimicked that established by Armstrong<sup>16</sup> and involved continuous monitoring of heart rates for twelve hours on three week days and one weekend day (usually Saturday). It is recognised that heart rate is not a direct measure of physical activity, though it reflects the stress placed on the cardiovascular system by physical activity.<sup>16</sup> Given that heart rate can be also be influenced by other factors like temperature and emotional state, heart rate monitoring is considered only to be a valid tool for assessing moderate to vigorous levels of physical activity.<sup>17</sup>

Heart rates were monitored using Polar 2000 heart rate monitors (Polar, Kempe, Finland). The monitors were set to record continuously and store minute-by-minute heart rates. The children were asked to undertake their normal activity though they were required to remove the watch when swimming (this was a relatively uncommon activity at the time of year the study was undertaken which was Autumn and Winter). The monitors were attached to the children between 8.00 am and 8.45 am and were removed by the children's guardians twelve hours later. The monitors were retrieved and the stored data were downloaded onto a Macintosh Powerbook via a Polar computer interface.

For each subject, and each day, the number of minutes where their heart rate exceeded 139 bpm was determined. Heart rates in excess of 139 bpm were deemed to represent the subjects undertaking moderate intensity physical activity. This threshold follows Armstrong's methodology<sup>16</sup> for monitoring physical activity in children and also

allows for international comparisons to be made. Armstrong and his colleagues determined that brisk walking at 6 km.h<sup>-1</sup> elicits a steady state heart rate of 140 bpm in 5-16 year olds. 27 of the 60 subjects in the present study also averaged a steady state heart rate of 139.6± 14.3 (mean ± SD) bpm when walking on a treadmill at 6 km.h<sup>-1</sup>, supporting Armstrong's finding.<sup>16</sup>

Children who accumulated 30 minutes per day with their heart rates >139 bpm on three of the four collection days were deemed to have met the Ministry of Health's physical activity guidelines.<sup>42</sup> Unpaired t-tests were used to analyse the differences in the accumulated minutes above a heart rate of 139 bpm between schools, weekday versus weekend day, and gender. A Type I error of 5% was chosen for the declaration of statistical significance; precision of estimates are represented by the 95% confidence interval (CI, the likely range of the true estimate). In order to make a comparison between the New Zealand children and English children of the same age, the percentage of complying children were estimated from Armstrong's data.<sup>16</sup>

## Results

53% of the 60 children tested (63% of males, 43% of females) accumulated a minimum of 30 minutes of moderate intensity physical activity on at least three of the four days monitored (Table 1). 48% of children had one day or more when they did not accumulate at least ten minutes of moderate intensity physical activity. Overall boys spent on average fifteen minutes (95% confidence interval 3-27, p<0.05) more time per day than girls at a heart rate above 139 bpm.

Table 1. The proportion of children achieving the physical activity guidelines and their average daily minutes at a heart rate above 139 beats per minute.

Decile	School 1 10		School 2 5		School 3 2		Totals	
	male	female	male	female	male	female	male	female overall
% achieving guidelines	40	40	100	20	50	70	63	43
Accumulated mins >139 bpm/day	47.5	53.4	67.6	25.3	56.4	46.7	57.2*	41.8*
	21.0	24.5	20.3	6.0	32.6	17.2	25.8	20.9

Heart rate data are the mean ± SD, \* p < 0.05 for gender comparison. Decile 10, 5 and 2 are high, medium and low socio-economic school ratings respectively.

There was no significant difference between the accumulated heart rates >139 bpm on the weekend (43 minutes) compared to the weekdays (51 minutes). There was no significant difference between the number of children achieving the recommended guidelines from the schools of different decile ranking (socio-economic status). Neither was there any significant difference in the mean number of accumulated minutes >139 bpm per day between subjects from the different schools.

The percentage of English 10-13 years old meeting the physical activity guidelines was estimated to be 55%<sup>16</sup> which is comparable to the 53% complying in the present study.

## Discussion

The present study using physiological techniques, found that 53% of 10-13 year olds met the Ministry of Health's guidelines for participation in physical activity in order to gain health benefits. Although subject numbers were relatively low and confined to a selected region of New Zealand, the results indicate worrying levels of inactivity in Christchurch children, which may reflect a national problem. All other New Zealand studies to date have used questionnaire methodologies using either self or proxy reporting.<sup>16-20</sup> A recent proxy report survey conducted by the Hillary Commission found that 73% of 9-12 year olds meet the minimum guideline that subjects be active for 2.5 hours per week.<sup>16</sup> The Hillary Commission's findings are consistent with international studies using questionnaires, which report 60-70% of children undertake appropriate amounts of physical activity.<sup>17</sup> It is generally understood that despite questionnaires being able to sample large numbers of subjects, they tend to overestimate the actual amount of time participants are active.<sup>9</sup> This may explain the differences between the present study's finding and previous studies.

Literature reviews of physical activity epidemiology report an almost consistent finding of greater physical activity participation by males compared to females.<sup>9,17</sup> In addition, it appears that males are approximately 15-25% more active than females.<sup>21</sup> The present study reports that ten to thirteen year old boys spend significantly more of their

time with their heart rates elevated above 139 bpm than girls. The 1998 Physical Activity Survey<sup>16</sup> found significantly more boys (74%) achieved the physical activity guidelines compared to girls (64%). The Dunedin Multidisciplinary Study<sup>19</sup> and the Life in New Zealand survey<sup>20</sup> observed higher levels of male participation in leisure-time physical activity and vigorous activity respectively, than females, as did a recent Australian survey<sup>22,23</sup> of participation in sport and physical activity by five to fourteen year olds. The gender differences in physical activity participation may, in part, be attributed to differences in the independent mobility between girls and boys. A study of English children reported that a greater proportion of boys were allowed to cross roads, cycle on roads, take buses and to go to leisure places on their own.<sup>24</sup> This lack of independence may affect girls' ability to participate in sport and active leisure pursuits, and to walk or cycle to school.

There are indications that children's lives are becoming more sedentary; it appears that activity levels in British children have fallen since the 1930s.<sup>25</sup> Electronic entertainment (eg watching television and playing computer games) takes a significant proportion of children's total leisure time<sup>26</sup> and the incidence of active transportation to school by walking or cycling is declining.<sup>27</sup> Additionally, the amount of timetabled physical education taught in schools is decreasing.<sup>28</sup> Given these trends, there is cause for public health concern. It is therefore heartening that the recently released New Zealand Health Strategy<sup>29</sup> is placing a priority on the objective to increase the level of physical activity of the population. It is hoped that this strategy will help improve the currently low proportion, indicated by the present study, of children attaining the New Zealand physical activity guidelines.

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