ORIGINAL ARTICLE

TRENDS IN PHYSICAL ACTIVITY IN GREENLANDIC SCHOOLCHILDREN, 1994–2006

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ABSTRACT

Objectives. To describe trends in self-reported physical activity among Greenlandic schoolchildren from 1994 to 2006, and to analyse associations between physical activity and quality of life, health, academic achievement, school satisfaction and substance use.

Study design. Trend analysis of the Greenlandic data reported in the Health Behaviour in School-Aged Children (HBSC) survey on 11, 13, and 15 years olds in 1994, 1998, 2002 and 2006.

Methods. Analyses of associations data on all participating children in Greenland who were 11 to 17 years old in 2006 were used.

Results. Only about 30% of all children aged 11, 13 and 15 years fulfilled the national recommendations of being moderately physically active for 60 minutes a day. A higher proportion of children were highly physically active in 2006 compared with earlier years while no trend was seen in the proportion of inactive children. Fewer children were moderately active as they aged, but at the same time more children seemed to become more physically active with increasing age. Fewer children in the settlements were highly physically active compared with children living in the towns and the capital. Physically active children had good academic achievement, good self-rated health and smoked less on a daily basis when compared with inactive children.

Conclusions. The results indicate that an increase in the level of physical activity among schoolchildren instead of a general decrease has taken place from 1994 to 2006. A high level of physical activity was associated with a positive rating of health, good quality of life and good academic achievement. The low number of highly physically active children living in the settlements is of concern.

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Keywords: HBSC survey, children, Greenland, physical activity, health, smoking
INTRODUCTION

In view of its health benefits, increasing the physical activity levels among youth is an important public health challenge. Physical activity is an important focus of the Greenlandic public health program, and the program’s national recommendation is 1 hour of moderate physical activity daily for children (1).

The rapid societal changes that have taken place during the last 50 to 100 years (2) have had consequences for all areas of society. Although the effects of the epidemiological transition on the life and health of Greenlandic children have not been fully assessed, they are substantial (3,4). Today, Greenlandic children are physically healthier, and the dominating illnesses are both infectious and chronic diseases. Some of the emerging chronic diseases, for example, obesity, are highly influenced by life-style and health behaviour. In Western countries, a general decrease in physical activity in the child population is considered a contributing factor to the increasing number of overweight children. Although physical activity can prevent the development of obesity, it also has positive health effects on fitness, muscle mass and bone density (5) and positive effects on children’s psychological well-being (6). In addition, an active child is more likely to be an active adult (7).

It has been taken for granted that children in Greenland are spending less time being physically active and more time sitting behind a TV or a computer screen, yet evidence of these trends and analyses of the fulfillment of the national recommendations on physical activity in Greenlandic children have not been published so far. When compared internationally, Greenlandic children are among the most active. In 2006, 15-year-olds ranked second and younger children ranked fourth among the 40 countries or regions participating in an international survey (8).

The aim of this study was to describe trends in self-reported physical activity and TV-watching among Greenlandic schoolchildren from 1994 to 2006 and to analyse the associations between physical activity and the quality of life, health, academic achievement, school satisfaction and substance use.

MATERIAL AND METHODS

The study was based on data from the Health Behaviour in School-Aged Children (HBSC) study in Greenland. The present study included data from the Greenlandic part of the international HBSC survey database, including 11-, 13- and 15-year-old students for 1994, 1998, 2002 and 2006 in trend analyses. Analyses of association data on all participating children in Greenland aged 11 to 17 years in 2006 were included.

HBSC is an international WHO collaborative study with cross-national surveys performed every fourth year. The students are asked to answer a standardised questionnaire during a school lesson after instruction from the teacher. Because of the small population in Greenland, all schools with children in Grades 6 to 11 (11 to 17 years old) are asked to participate. In the years 1994, 1998, 2002 and 2006, 62%, 60%, 62% and 67% of schoolchildren in the participating schools completed the questionnaire (9).
Physical activity was measured by 3 items:

1. Over the *past 7 days*, on how many days were you physically active for a total of at least *60 minutes* per day? (Answers: 0–7 days.)
2. OUTSIDE SCHOOL HOURS: How often do you usually exercise in your free time so much so that you get out of breath or sweat? (Answers: Every day / 4 to 6 times a week / 2 to 3 times a week / Once a week / Once a month / Less than once a month / Never.)
3. OUTSIDE SCHOOL HOURS: How many *hours* a week do you usually exercise in your free time so much so that you get out of breath or sweat? (Answers: None / About half an hour / About 1 hour / About 2–3 hours / About 4–6 hours / About 7 hours or more.)

Up to and including 1998 and again in the 2006 survey, physical activity was measured by the items focusing on vigorous physical activity outside of school hours, in terms of frequency and duration (questions 2 and 3 above). Since 2002, items measuring moderate to vigorous physical activity (question 1) were introduced (10). It was therefore possible to follow age- and gender-specific trends in both vigorous physical activity (from 1994 to 2006) and moderate to vigorous activity (from 2002 to 2006) in the age groups 11, 13 and 15 years with a focus on fulfilling national recommendations, proportion of inactive children (defined as exercising vigorously for half an hour/week or less) and highly physically active children (defined as exercising vigorously 4 hours or more/week). The differences in living conditions and the possibility of indoor physical activity meant that the level of physical activity was compared between Nuuk (the capital), towns and settlements.

TV-watching was included with one item:

4. ON WEEKDAYS: About how many hours a day do you usually watch television (including videos and DVDs) in your free time? (Answers: None at all / About half an hour a day / About 1 hour a day / About 2 hours a day / About 3 hours a day / About 4 hours a day / About 5 hours a day / About 6 hours a day / About 7 or more hours a day.)

For the 2006 data, tests were done to analyse the association between physical activity and often being with friends after school (dichotomized as: 0–3 days/4–5 days), self-assessment of health (dichotomized as: Excellent + Good/Fair + Poor), quality of life (dichotomized as: Very good + Good/ Average + Below average), school satisfaction (dichotomized as: I like it a lot + I like it a bit/I don’t like it very much + I don’t like it at all) and eating sweets (dichotomized as: Never + Less than once a week + Once a week + 2–4 days a week + 5–6 days a week/ Once a day, every day + Every day, more than once). Among the 15–17-year-olds, associations with daily smoking and having been drunk 4 times or more were tested as well.

For the statistical analysis, chi-square test and chi-square test for trends were made in SPSS 15.0 and Epi6, and p-values below 0.05 were regarded as statistically significant.
RESULTS

The study included 1,302 students in 1994, 1,648 in 1998, 891 in 2002 and 1,366 in 2006 in the age groups 11, 13 and 15 years with the same proportion of students in each age group and of both genders each year.

Physical activity

Moderate physical activity 60 minutes every day: In 2002 and 2006, 29.5% and 28.9% had been physically active 60 minutes every day in the last week on average — that is, 37.7%, 27.4% and 22.6% of 11, 13 and 15 years olds were active in 2002 (p<0.001), and 34.5%, 25.8% and 26.3%, respectively, were active in 2006 (p=0.17). In 2002, 31.9% of boys and 27.5% of girls (p=0.08) were moderately physically active every day in the last week, compared with 33.7% of boys and 24.4% of girls in 2006 (p<0.001).

Highly physically active (4 hours or more vigorous physical activity/week): From 1994 to 2006, more boys (p=0.02) and more girls (p<0.001) became highly physically active. In all years, there were more highly physically active boys than girls (in 1994, p<0.001; in 1998, p<0.001; in 2006, p=0.002). Among boys aged 15 (p=0.01) and among girls aged 11 (p=0.01) and 15 (p=0.03), an increase in the proportion of those who were highly physically active was seen. Trends showed that more of the older girls became highly physically active with age in 2006 (p=0.01) and more of the boys became highly physically active with age in 1998 (p=0.04) and 2006 (p=0.01) (Fig. 1).

Figure 1. Proportion of vigorously physically active children (4 hours or more/week) in 1994 to 2006.
Physical inactive (half hour or less of vigorous physical activity/week): For all years, more physically inactive girls than boys were observed (p<0.001 in 1994, 1998 and 2006). There was no obvious trend in the number of inactive boys (11 year olds, p=0.22; in 13 year olds, p=0.68; in 15 year olds, p=0.75; in all boys, p=0.37). Among girls, more inactivity at age 11 was seen (11 year olds, p=0.01; in 13 year olds, p=0.15; in 15 year olds, p=0.77; in all girls, p=0.31). A higher proportion of girls became physically inactive with age; this became statistically significant in 1998 (p=0.008), while no trend in inactivity by age was seen in boys (Fig. 2).

TV-watching
A decrease in the proportion of boys spending time watching TV 2 hours or more/day was found (from 68.5% in 1994, 69.7% in 2008, 70.3% in 2002 to 59.3% in 2006) (p=0.001) but not in girls (57.4%, 62.6%, 59.2% and 61.5%, respectively) (p=0.3). Among 11-year-old boys, TV-watching (2 hours or more/day) decreased from 66.2% in 1994 to 48.6% in 2006 (p=0.001), followed by the 13-year-olds from 68.9% in 1994 to 56.5% in 2006 (p=0.015), while the TV-watching among 15-year-old boys remained increased slightly from 70.9% in 1994 to 72.9% in 2006 (p=0.9). Among girls, the number watching a lot of TV was unchanged in all age groups (Fig. 3).

![Figure 2. Proportion of physically inactive children (half an hour or less/week) in 1994 to 2006.](image-url)
In 2006, 2,462 children aged 11 to 17 years participated.

**Vigorous physical activity and place of living**

**Highly active:** Both more boys and girls in Nuuk were more vigorously physically active. While the mean of highly active boys was 21.3%, it was 27.4% in Nuuk, 19.6% in towns and 17.8% in villages (p=0.001). The mean of highly active girls was 13.9%, and 17.3% in Nuuk, 13.3% in towns and 10.7% in villages (p=0.02). **Inactive:** Insignificantly fewer boys and girls in Nuuk were vigorously physically inactive. The mean of inactive boys was 29.5% and girls 41.1%; in Nuuk 26.4% of boys and 37.6% of girls, in towns 31.3% and 43.1%, and in villages 26.5% and 38.1%, respectively.

**Vigorous physical activity, being with friends, academic achievement, school satisfaction, self-rated health, quality of life, eating sweets and substance use**

**Academic achievement:** More physically active boys and girls both reported that their teacher rated them as “very good” or “good” compared with the other students. **School satisfaction:** Being active or inactive did not influence school satisfaction among boys and girls. **Being with friends:** While highly active boys were together with friends after school 4 or 5
days/week (p<0.001), no significant difference in the activity level was seen in girls. **Health:** Physically active boys and girls regarded their health as “excellent” or “good” (p=0.04 and p=0.01, respectively). **Quality of life:** More physically active girls rated their quality of life as good (6 or above on Cantril’s ladder) (p=0.01), while the difference in boys was not statistically significant. **Eating sweets:** No differences were seen between active and inactive boys or girls in the daily intake of sweets. **Daily smoking in 15–17 year olds:** A smaller amount of the highly active boys smoked every day (p=0.04) compared with inactive boys, while no difference was seen in girls. **Drunk 4 times or more in 15–17 year olds:** No difference was found in the proportion of boys or girls that had been drunk 4 times or more in their lifetime according to their activity levels (Table II).

### Table I. Proportion of vigorously active (4 hours or more/week) and inactive (half an hour or less/week) children in the capital, towns and villages.

|                | 2006 Capital | Towns | Villages | All     |
|----------------|--------------|-------|----------|---------|
| **Boys**       |              |       |          |         |
| Highly active   | 27.4         | 19.6  | 17.8     | 21.3    | p=0.001 |
| Inactive       | 26.4         | 31.3  | 26.5     | 29.5    | p=0.07  |
| **Girls**      |              |       |          |         |
| Highly active   | 17.3         | 13.3  | 10.7     | 13.9    | p=0.02  |
| Inactive       | 37.6         | 43.1  | 38.1     | 41.1    | p=0.06  |

### Table II. Comparison between vigorously active and inactive children.

| 2006                          | Boys Inactive | Active | Girls Inactive | Active |
|-------------------------------|---------------|--------|----------------|--------|
| “Very good” or “good” academic achievement | 59.6 | 69.7 | 58.0 | 71.5 | Boys: p=0.03 | Girls: p=0.001 |
| Like school                   | 78.9 | 79.3 | 74.4 | 75.6 | Boys: p=0.9 | Girls: p=0.5 |
| With friends after school 4–5 days/week | 58.8 | 71.7 | 59.6 | 62.9 | Boys: p<0.001 | Girls: p=0.07 |
| Self-rated health “excellent” or “good” | 77.1 | 86.3 | 68.0 | 77.7 | Boys: p=0.04 | Girls: p=0.01 |
| Self-rated good quality of life | 82.2 | 89.0 | 73.7 | 81.8 | Boys: p=0.06 | Girls: p=0.01 |
| Eating sweets daily           | 31.9 | 34.9 | 41.9 | 44.5 | Boys: p=0.6 | Girls: p=0.5 |
| Daily smoking*                | 61.0 | 43.0 | 61.2 | 48.3 | Boys: p=0.04 | Girls: p=0.1 |
| Been drunk 4 times or more*   | 27.2 | 33.6 | 23.9 | 30.3 | Boys: p=0.3 | Girls: p=0.3 |

* = in children 15–17 years old.
DISCUSSION

The potential for sedentary activity in children is perhaps greater than ever before and with increasing age more time is spent in front of the television screen (9). Even if younger children in Greenland did watch TV to a lesser extent than most European children in 2002 (11), about one-quarter of children are heavy television watchers spending 4 hours a day or more in front of the TV. Although, the same number of children watch TV to a very limited extent, half an hour a day or less. In most European countries a decline of the proportion of children that are physically active are seen with age, particularly among girls (12). It was therefore expected that the amount of both moderately and highly physically active children would have decreased after 1994. In contrast, the trend was that a higher proportion of boys and girls were more physically active in 2006 than before, with the most pronounced increase in the 15-year-olds. In addition, no increase in the amount of inactive boys was observed. Only among 11-year-old girls had the number of inactive girls increased.

Despite the increase in highly active children, only about 30% of all children aged 11, 13 and 15 years fulfilled the national recommendations of being moderately physically active 60 minutes a day in both 2002 and 2006. This study revealed that fewer children were moderately active and did not fulfil the recommended level of activity for their age. At the same time, a trend showing that both girls and boys were becoming more physically active with increasing age was seen.

Moderate physical activity and vigorous physical activity seem to be 2 distinct measures. Moderate physical activity provides a picture of total activity, and light or moderate physical activity and the amount of activity of this intensity is easily underestimated (13). Vigorous physical activity explicitly encompasses a dimension of physical activity as a recreational pursuit or hobby. A confirmatory factor analysis among adolescent girls indicated that the 2 measures express different behavioural patterns and may even have different outcomes (14).

The results indicate that during the period under study a differentiation in the level of physical activity among schoolchildren instead of a general decrease has taken place. While the same numbers of children are moderately physically active, a rather small but increasing proportion of children of both sexes are highly physically active, and the number of inactive children remains unchanged.

It has been proposed that the key determinants for young people’s physical behaviour include demographic factors (e.g., the greater likelihood of activity in younger people, particularly boys), psychological factors (e.g., perceived competence and enjoyment), social factors (e.g., encouragement from parents, siblings and peers) and the physical environment (e.g., the availability of facilities and programs) (15,16). Sport and exercise are social activities that increase when family members and best friends participate. As youth age, the motivation for taking part in sports seems to be increasingly fun oriented and decreasingly achievement oriented (17). Physical activity must therefore be considered in connection with other life conditions and activities.
The finding that fewer children in villages are vigorously physically active during their leisure time were both surprising and concerning. The finding was a surprise since the most traditional life-style of earning a living from small-scale fishing and hunting is still found in the villages and involves physical activity. Another concern is the display of negative health behaviours, especially eating habits, among village children when compared with children in towns and especially in Nuuk, the capital (9). The physical environment itself can promote or constrain these behaviours (18). The availability of leisure time activities in villages is determined by the local sociodemographic conditions and possibilities. Furthermore, the children in the villages are often a less privileged group socio-economically, which itself might be a factor in the low levels of physical activity (19).

In order to increase overall levels of physical activity, it is important to identify and understand factors that influence participation (5,20). The national public health strategy has discussed new ways of increasing these levels in the population and has sought to identify the determinants of physical activity in order to address potential barriers and promote opportunities for being physically active. Among inactive children, the opportunities for physical activity offered to them in their schools form a significant part of their overall exercise. Therefore, schools and other institutions for children have a key role to play. The main source of physical activity in schools is physical education lessons, and during breaks students can decide whether or not to be physically active. The promotion of physical activity in the school setting should therefore be considered an important aspect of the national and local programs that aim to increase physical activity among children.

When associations between being highly physically active and other life conditions were analysed, positive associations with some life-style factors were revealed. A higher proportion of highly physically active children reported good health, good quality of life and better academic achievement compared with their inactive counterparts. More physically active boys spent more time with their friends after school nearly every day. Also, internationally, it has been shown that young people who often meet up with their friends are more likely to be more physically active than their peers who are less socially inclined (21). It was also found that inactive older boys were more often daily smokers. Although promising from a public health point of view, these findings need further analysis before being implemented in health promotion strategies.

The study had some methodological limitations. In contrast to physical performance, the level of physical activity is generally difficult to measure (22), especially at a population level. On one hand, objective and subjective measurements, such as questionnaires about physical activity, show significant although not strong associations. Epidemiological questionnaire-based studies have, on the other hand, been found to agree and the method has proved useful (22). Although precise measurement of physical activity by self-administered reporting cannot be achieved, self-reported physical activity has been found to correlate with laboratory interviews and measured maximal oxygen intake (23). A review of literature on the measurement of physical activity using questionnaires (24) suggested that self-report
measures have value in monitoring changes in population activity; however, it concluded that “despite extensive use over 40 years, physical activity questionnaires still show limited reliability and validity” and a detailed interpretation of the amount of exercise and the associated health benefits based on self-report measures is too ambitious an undertaking. An Australian study investigating the HBSC items measuring vigorous physical activity suggested that the items had acceptable reliability and validity (25).

In conclusion, only about 30% of all children aged 11, 13 and 15 years fulfilled the national recommendations of being moderately physically active 60 minutes a day. Fewer children were moderately active as they aged, but at the same time, a higher proportion of children seemed to become highly physically active with increasing age. Fewer children in the settlements were highly physically active compared with children in the towns and the capital. A higher proportion of physically active children had good academic achievement, good self-rated health, were together with friends nearly every day and fewer of the physically active boys smoked compared with their inactive counterparts. The expected decrease in the time spent being physically active was not found. The results indicate that an increase in the level of physical activity among schoolchildren, instead of a general decrease, has taken place from 1994 to 2006.

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