Body Composition and Cardiovascular Health in School-aged Children

The Childhood Health, Activity and Motor Performance School Study Denmark

An evaluation on the health effect of sport schools in the Svendborg Project

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English summary

Background

In 2011 the World Health Organization (WHO) estimated that more than 40 million children under the age of five were overweight and ten per cent of the world's school aged children are estimated to carry excess body fat. Childhood obesity is associated with a number of immediate cardiovascular health consequences and linked to subsequent morbidity and mortality in adolescence and adulthood. The issue is of growing concern for public health and therefore an important area for health researchers to address. Physical activity is essential for the wellbeing and normal growth of children and youth and plays an important role in the prevention of overweight and obesity and related morbidities.

Schools are recognized as potentially effective settings for public health initiatives, as they access a large population of children and youth across a variety of ethnic and socioeconomic groups without stigmatizing specific subgroups of high-risk children. The WHO specifically identified schools as a target setting for the promotion of physical activity among children and youth. During the last decades a considerable number of school-based, physical activity promotion and overweight prevention studies have been conducted, and their effectiveness on health outcomes evaluated. However, design and methods of these school-based studies differ, and results are not univocal, and more research is required on duration and volume of interventions in large-scale cohorts with long term follow up.

This thesis consists of 4 articles describing and evaluating a natural experiment, The Svendborg Project, in 10 public schools in the Municipality of Svendborg, Denmark. The experiment focused on increasing the amount of mandatory physical education (PE) lessons from two to six lessons per week. The Childhood Health, Activity and Motor Performance School study (CHAMPS study-DK) is the scientific research part of the Svendborg Project evaluating the initiative.

Purpose and objectives of the thesis

The overall aim of this thesis is to evaluate the effect of four extra PE lessons in primary school (pre-school to 6th grade) on health related outcomes in children.

The objectives are:

1. To describe the Svendborg Project and the CHAMPS study-DK (paper I).

2. To evaluate the effect of four extra PE lessons per week in primary schools on body composition and weight status in children aged 8 to 13 (paper II).
3. To evaluate the effect of four extra school-based PE lessons per week on future cardiovascular disease (CVD) risk factors in children aged 6 to 13(paper III).
4. To examine the prospective associations of cardio respiratory fitness (CRF) and direct and indirect indicators of adiposity with CVD risk factors in apparently healthy Danish children 7-11-years followed over 2 years. Furthermore, to examine the association of change in adiposity and CRF with change in CVD risk factor levels during follow-up (paper IV).
5. To recommend directions for future research and public health initiatives based on the results.

Methods

This study is based on prospective data from 10 public schools, six intervention and four control schools matched according to the uptake area of the schools and socio-economic position of the parents. Intervention schools provided four additional PE lessons per week, where as control schools continued as usual (two PE lessons per week). A total of 1507 children (intervention n=773, control n=734) attending pre-school to the 4th grade in 2008 were invited to participate in the CHAMPS study-DK and 1218 (81%) children and their parents accepted. Height, weight, waist circumference, DXA scans, Cardio respiratory fitness (CRF), blood pressure, pubertal stage and fasting blood samples were obtained at baseline (2008) and follow-up (2010). Information on parental education level, household income and birth weight were collected from questionnaires during the first school year.

Results

Intervention had beneficial, but non significant effect on mean BMI or mean Total Body Fat percentage (TBF%), but a significant beneficial effect on overweight and obesity prevalence, as children at intervention schools had a significant reduced risk of becoming overweight or obese after 2 school years compared to children at control schools. Also composite risk score and most single risk factors for CVD changed significantly more in favour of children attending intervention schools compared to children attending control schools. Baseline adiposity was independently and positively associated to increased composite CVD risk score

after 2 years. Adjusted for CRF this association attenuated, but stayed significant and independent. The associations were linear across the entire distribution of adiposity and CRF.

Conclusion

Evaluation of this natural experiment showed that six PE lessons per week significantly changed prevalence of overweight and obesity after two years, also mean BMI and TBF% improved in intervention schools, though not significantly different from control schools. CVD risk factors significantly decreased in intervention schools compared to control schools. The intervention had a larger effect in children who were overweight and obese, or had the highest (over median) CVD risk scores at baseline. The shape and magnitude of associations of adiposity and CRF with CVD risk factors, suggest that any effort to shift the population distribution of adiposity downwards would be valuable for early CVD prevention in primary school children.

Overall, results support that a simple and relatively easily adaptable intervention, like the Svendborg Project, has the potential to positively affect future public health.