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Effects of a Danish multicomponent physical activity intervention on active school transport

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ABSTRACT

Introduction: Walking and bicycling to school yields great potential in increasing the physical activity levels of adolescents, but to date very few intervention studies have been evaluated. The aim of this study was to evaluate the effect of a multicomponent school-based physical activity intervention on adolescent active school transport (AST) and three intermediate outcomes: perceived school route safety, parent support and attitude towards bicycling.

Methods: In total, 1014 adolescents at 14 schools filled in a transport diary at baseline and at a two-year follow-up and were included in the primary outcome analysis. Mean age at baseline was 12.6 years (range: 11.0–14.4 years). Seven of the schools were randomized to the intervention which was designed to change the organizational and structural environment at the schools, thereby increasing non-curricular physical activity i.e. recess activity, active transport and after-school fitness program. Transport mode to school was assessed through a 5-day transportation diary.

Results: The proportion of active transport was high at baseline (86.0%) and was maintained at the two-year follow-up (87.0%). There was no difference in active travel between the intervention and the comparison schools after the intervention, but more students perceived parental encouragement and had a positive attitude towards bicycling at the intervention schools. This difference was however only borderline significant.

Conclusion: The prevalence of AST was high at both baseline and follow-up, but no difference between the intervention and comparison schools was detected. Future intervention research should ensure a high degree of involvement of students, teachers and parents, focus merely on AST and take advantage of already planned physical environment changes in well-designed natural experiments.

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1. Introduction

The health benefits of walking and bicycling for transport are widely accepted and scientifically supported (Bauman et al., 2011; Davison et al., 2008), and active school transport (AST), defined as physical active commuting to and from school, has been proposed as a way to decrease obesity rates among children and adolescents (Faulkner et al., 2009; Lubans et al., 2011). Several other benefits associated with AST have also been reported e.g. independent mobility and cognitive functions (Martínez-Gómez et al., 2011; Mitra, 2013). If the proposed tracking of active transport to adulthood is strong (Tudor-Locke et al., 2001; Wong et al., 2011), the benefits for society will be magnified in terms of decreasing the negative side effects of automobile transport e.g. greenhouse-gas emission and congestion, while at the same time contributing to more lively neighborhoods (Gehl, 2010; Woodcock et al., 2009).

In a review of interventions promoting AST, 14 studies were included and only one of those was targeted students older than 12 years (Chillon et al., 2011). Due to a large variation in intervention programs, the review categorized the initiatives according to the Active Living by Design (ALBD) 5P model: preparation, promotion, programs, policy and physical projects (Bors et al., 2009). The ALBD model builds on an ecological framework (Sallis et al., 1998) and suggests that initiatives are most successful if all 5Ps are incorporated, i.e. that changes to policy and the physical environment occur together with more traditional information and education initiatives (promotion and

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programs), and that these initiatives are supported by collaborating partnerships from various fields (preparation phase) (Bors et al., 2009). However only two studies incorporated all 5P's, and four other studies incorporated changes to the physical environment or to the school policy. The remaining eight studies used preparation, programs and promotion initiatives. Most studies reported an increase in AST, but in general the effect sizes were small, and due to large variation no clear recommendations could be made to increase the effectiveness of future interventions. Therefore, the review emphasized the need for high-quality evaluations of AST interventions, and especially interventions targeting adolescents. Future studies were furthermore encouraged to evaluate proposed intermediate outcomes based on theoretical frameworks of behavioral change (Chillon et al., 2011). One potential intermediate outcome could be the perception of route safety, which is a shared element of most presented frameworks (McMillan, 2005; Ogilvie et al., 2011; Panter et al., 2008). It includes both the objective traffic route safety and the abilities and perceptions of the individual. Another important intermediate outcome is the encouragement or support from parents, which also has been incorporated in two relevant frameworks for AST (McMillan, 2005; Panter et al., 2008). In the framework by Panter et al. (2008) it is described as a decision-making process in which both parents and the child have influence on the final choice. The attitude towards active transport could also be affected by an intervention, and is also interconnected to other factors. Panter et al. (2008) hypothesized that a positive attitude towards AST will prompt a more positive perception of the route safety, but one could also propose that the relationship is reciprocal i.e. that a safe route will cause a positive attitude towards AST and active transport in general (Sirard and Slater, 2008).

AST is very common in Denmark and a representative study from 1998 to 2000 showed that approximately 60% of children aged 11–15 years cycled and 20% walked to school. The high levels of AST has been ascribed to a long lasting effort to develop and maintain safe route to school, active transport education at the schools, and systematic promotion by lobby organizations (Jensen, 2008). A typical Danish public school has 300–500 students from 6 to 16 years, and half of them has less than 1.5 km to school (Jensen, 2008). Even though there are good conditions for AST in Denmark, the romantic presentation of a country where even most 5-year olds children cycle to school is overstated (Fotel and Thyra, 2004). The prevalence of children walking and cycling to school have decreased the last 30 years, as in the rest of the world, but among 11–15 year olds it is still considerable higher than in most other countries (Fyhri et al., 2011).

The primary objective of the current study is to evaluate whether the multicomponent intervention was effective in increasing or preventing a decrease in AST. In addition we investigate intervention effect on perceived route safety, parental encouragement and student attitude towards bicycling. Finally, we investigate if gender, baseline AST, perceived environment, distance to school, parental encouragement and objective walkability of the school site moderate the intervention effect.

2. Material and methods

2.1. Design and study population

The study is based on data from the multicomponent intervention *SPACE—for physical activity*. The intervention is a comprehensive school-based intervention to improve non-curricular PA through changes of the physical and organizational environment supported by educational activities. It has a cluster randomized controlled design, and is described in detail elsewhere (Toftager et al., 2011). After an open invitation 21 schools in the Region of Southern Denmark enrolled in 2009, and to improve the homogeneity between the intervention and control group the schools were analyzed and matched pairwise according to eight variables i.e. Euclidean distance from residence to school for 5th and 6th graders; area household income; area education level; area ethnicity distribution; school district urbanity; condition and characteristics of school outdoor areas; school health policy; and active transport in the local area. The seven most identical pairs of schools were then randomized one by one to the comparison or intervention group (Toftager et al., 2011).

Baseline measurements with questionnaires and diaries were obtained in spring 2010 from the 5th and 6th grade in all 14 schools, with follow-up measurements at almost the same week in 2012 in the 7th and 8th grade (Fig. 1). The transport diary and web-based questionnaire were pilot-tested prior to the main data collection including cognitive interview validation (Collins, 2003; Toftager et al., 2011). Data collection was conducted in pairs (one intervention school and one comparison school at the same time) to minimize the influence of season and weather conditions. Parents and students received written information about the study, and were informed that participation was voluntary. We used a passive informed consent procedure, where students were included unless the parents withdrew consent. This procedure has been found to be ethically appropriate in low-risk research in adolescents (Santelli et al., 2003). The Danish National Committee on Health Research Ethics reviewed the study protocol and concluded that formal approval was not required. The study is registered and listed in the Danish Data Protection Agency (reference number: 2009-41-3628) and registered in the Current Controlled Trials (ISRCTN79122411).

2.2. Intervention

The intervention package comprised 11 components targeting non-curricular PA, i.e. recess PA, after-school fitness program and active transport. Schools and municipalities were requested and supported to implement all 11 components, but there were no defined criteria to exclude schools with incomplete implementation. A detailed description of the intervention components was delivered to all participating schools, with the possibility for smaller individual adjustments and tailoring to the local context. All 11 components and details of implementation are described in detail elsewhere (Toftager et al., 2011). However, the components targeting active transport are elaborated in the following.

Four components were directly targeting active transport, and could be divided into policy, programs and physical initiative according to the ALBD model (Bors et al., 2009). The implementation of the interventions began simultaneously in autumn 2010. The *policy initiative* consisted of formulating and implementing a school PA policy, including active travel to school, which was implemented at all intervention schools. Examples of the content of the PA policy targeting AST were: (1) encouraging parents to minimize school transport by car, practice active transport to school and be active transport role models; (2) endorse traffic education initiatives for all age groups at the school and use active travel in educational settings; (3) goal setting for active transport and a declaration of intent to work with municipalities and other stakeholders to improve the safety of the environment for AST.

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