Preventive Medicine 56 (2013) 82–85

Contents lists available at SciVerse ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Brief Original Report

Acceptability of standing workstations in elementary schools: A pilot study

Erica A. Hinckson [a,*], Saeideh Aminian [a], Erika Ikeda [a], Tom Stewart [b], Melody Oliver [b], Scott Duncan [b], Grant Schofield [b]

[a] Centre for Physical Activity and Nutrition, Centre for Child Health, Institute of Public Health and Mental Health, Auckland University of Technology, Private Bag 92006, Auckland, New Zealand
[b] Centre for Physical Activity and Nutrition, Institute of Public Health and Mental Health, Auckland University of Technology, Private Bag 92006, Auckland, New Zealand

ARTICLE INFO

Available online 23 October 2012

Keywords:
Accelerometer
ActivPAL
Physical activity
Sedentary
Sitting
Standing desks

ABSTRACT

Objective. To examine the acceptability of introducing standing workstations in elementary-school classrooms; and to quantify changes in children's time spent sitting, standing, and walking; step counts; sit-to-stand transitions; and musculoskeletal discomfort.

Methods. A controlled trial was conducted in two elementary schools in Auckland, New Zealand (March–May 2012). Participants were 30 third and fourth graders (n = 23 intervention, n = 7 control). Intervention classes received standing workstations; control class retained usual sitting desks. Children wore ActivPAL monitors over 7 days at baseline and during the fourth week of the intervention.

Results. Children spoke enthusiastically of the standing workstations. School staffs were supportive of the standing workstations because they offered "flexibility in learning". Overall, children in the intervention group sat less (intervention: 8.27 (1.45), mean (SD); control: 9.00 (0.80) h/day), stood longer (3.75 (0.88); 2.85 (0.30) h/day), and engaged in fewer transitions from sitting to standing (93 (17); 98 (26) counts) compared to the control group. Effect size ranged from small-large (−0.49; 95% confidence limits (0.64)%, 0.71; (0.48), −0.96; (0.54)% respectively). Results for time spent stepping and step counts were unclear.

Conclusion. Standing workstations can be successfully integrated in classroom environments and appear to decrease overall sedentariness.

Introduction

Children are naturally active (Boreham and Riddoch, 2001), but they are continually exposed to opportunities and environments that cause them to be sedentary (prolonged sitting) on a daily basis (Boreham and Riddoch, 2001). Sedentary behaviors in childhood are associated with risk of overweight and poor fitness, and raised cholesterol in adulthood (Hancox et al., 2004). Increased sedentariness in childhood predicts chronic fatigue syndrome in adulthood (Viner and Hotopf, 2004), and is associated with reduced academic achievement (Kristjánsson et al., 2009) and less energy expended during the day (Lanningham-Foster et al., 2006). Several studies have also shown (Grimes and Legg, 2004; Harreby et al., 1999; Trevelyan and Legg, 2010) an association between low back pain and sitting in children. An innovative approach to potentially reduce prolonged sitting and increase overall physical activity levels in children is to remove chairs and replace traditional desks with standing workstations in classrooms. However, the acceptability of standing workstations and consequences of increasing standing time in classrooms need to be explored before full implementation.

Methods

Participants

A sample of convenience of 30, children (14 boys, 16 girls, age 10 (1) years, mean (SD), height 1.43 (0.08) m, weight 45.57 (13.00) kg, BMI 23.11 (7.25) kg/m^2, waist circumference, 27.97 (4.65) cm) from three elementary school classrooms in Auckland, New Zealand participated in the study. Complete data were provided from 23 children in the intervention group (9 (1) years, 1.42 (0.08) m, 42.45 (11.00) kg, 22.49 (7.48) kg/m^2, 27.00 (4.12 cm)), and 7 children in the control group (10 (0) years, 1.49 (0.06) m, 56.28 (14.44) kg, 25.26 (6.42), 31.29 (5.16) cm). All 3rd and 4th grade children were invited to participate. For children's participation, we received parental consent along with child assent. Parental, principal and teacher consents were received prior to participation in focus group and semi-structured interviews. Ethical approval was granted from the Institution's ethics committee. The schools were located in the lowest socioeconomic area.

Design

Prior to introduction of standing desks, semi-structured interviews were conducted with 10 principals and teachers in 2011 to identify current teaching

* Corresponding author. Fax: +64 9 921 9746.
E-mail addresses: erica.hinckson@aut.ac.nz (E.A. Hinckson), saeideh.aminian@aut.ac.nz (S. Aminian), erika.ikeda@aut.ac.nz (E. Ikeda), tom.stewart@aut.ac.nz (T. Stewart), melody.oliver@aut.ac.nz (M. Oliver), scott.duncan@aut.ac.nz (S. Duncan), grant.schofield@aut.ac.nz (G. Schofield).

0091-7435/$ – see front matter © 2012 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.ypmed.2012.10.014

techniques and discuss standing desk designs. The intervention was conducted between March and May 2012, coinciding with the end of Summer and beginning of the Fall season in the southern hemisphere. Two schools participated in the study (control, one classroom; intervention, two classrooms). Upon completion of baseline data collection, standing workstations were introduced to two classrooms (3rd and 4th grades) of the intervention school for 4 weeks while the control classroom (4th grade) retained usual sitting desks. The 4th grade teacher of the intervention school was highly motivated in trialing the standing workstations in the classroom, whereas the 3rd grade teacher was less motivated. All measures were taken at baseline and during the last week of intervention.

Standing stations

Eight workstations (Ghanghao Furniture Factory, China) were used, five in the 4th grade and four in 3rd grade classrooms. Each set up included a circular workstation in the middle of the classroom and semicircular stations situated strategically around the central workstation (Fig. 1). The standing workstations were adjusted to children's height (83 cm, 96 cm and 109 cm for lowest, middle and highest workstations respectively). Children with similar floor-to-elbow height were grouped together. Workstations accommodated 4–5 children. Traditional desks and chairs were removed from the classrooms for the children who participated in the study. Exercise balls, bean bags, and mats were made available for children to sit when tired. There were no costs to the school, and the standing workstations were donated to the school at the end of the study. The 4th grade class continues to use the standing workstation but the 3rd grade class returned to traditional desks and chairs.

ActivPAL

The ActivPAL™ (PAL Technologies Ltd, Glasgow, UK) is a small accelerometer (5×3.5×0.7 cm) worn on the front of the thigh. It contains a uni-axial accelerometer and responds to signals related to gravitational forces and thigh inclination. Each ActivPAL™ monitor was tested for functionality and accuracy. The validity and reliability of the ActivPAL for measurement of postural allocation has been established in preschool children (Davies et al., 2012; Van Cauwenberghe et al., 2012).

Pain questionnaire

Children completed the Nordic musculoskeletal questionnaire about musculoskeletal aches and pains (Trevelyan and Legg, 2010).

Observations

Classrooms were observed weekly and random informal feedback was sought from children and teachers with regard to pain/discomfort and classroom set up.

Focus groups with children and parents

During the last week of the intervention, two focus groups with eight children each (8 boys and 8 girls) and interviews with parents (2 male participants) were conducted to gain an insight into children's and parents' reactions to the standing workstations.

Semi-structured interview with school staff

Semi-structured interviews were conducted with two teachers and one principal during the last week of intervention. The interviews focused on issues and practicalities of implementing the standing workstations within school classrooms.

Fig. 1. Standing workstations in the 4th grade classroom in Auckland, New Zealand (March–May 2012).