

Physical activity and the environment

Review Five:

BUILDING DESIGN

NICE guideline PH8 (published January 2008) has been updated and replaced by NG90.

New recommendations have been added on strategies, policies and plans to increase physical activity in the local environment (1.1.1 to 1.1.3); active travel (1.2.1 to 1.2.4 and 1.2.6 to 1.2.9); public open spaces (1.3.1 to 1.3.3). NICE has deleted some recommendations from the 2008 guideline because the evidence has been reviewed and the recommendations have been updated.

This evidence review is relevant to the updated guideline.

See the [guideline](#) for more details.

Executive Summary

This report examines the evidence for the effectiveness of interventions aimed at changing the design and amenities of buildings and the associated impact on levels of physical activity. This review covers a subset of the literature on physical activity and the environment which also includes the transportation system, local and regional scale design and planning features as well as the natural environment. The scope included interventions undertaken in a single building, in or across a set of buildings, or the environment surrounding a set of buildings (such as a university campus). Studies were included in this review if they assessed the effect of an intervention involving a modification or improvement to the physical structure of buildings. This included interventions that involve a modification to the physical building such as changes to the internal design of buildings, the provision of facilities or amenities (such as showers, bike storage), and internal decoration/ aesthetic qualities.

For inclusion a study had to include a measure of physical activity behaviour or use (such as walking/ cycling/ pedestrian counts). Only studies aiming to assess the impact of an intervention were included, cross sectional studies that examined the association (e.g. correlates research) between physical activity and building design were excluded. Ten studies were included, comprising 2 randomised controlled trials (1 randomised by worksite, and 1 randomised by the individual), 4 controlled before and after studies, 2 interrupted time series, 2 studies with post-intervention data only (1 with a comparison group). Studies were typically small scale and the number of environments under investigation was often limited, for example a study may involve only one building location (one worksite, or university campus) or a small number of schools.

The studies covered four main areas:

- **Workplaces**

The evidence from three studies, one (1+), one (2+) quality, and one (2-) quality, suggests that interventions that include changes to the built environment of a worksite may lead to both short- and long-term changes in levels of physical activity (Emmons et al., 1999; Leslie et al., 2000; Linenger et al., 1991).

From this set of 4 studies conducted in diverse settings and involving different worksites and different interventions, it is difficult to interpret any clear trends on how the content of the intervention may have influenced effectiveness. It does appear, however, that the provision of facilities or trails for walking, jogging or cycling, and improvements to existing or provision of new facilities (such as new space, improved equipment, or improved aesthetics [painting, carpet]) may lead to increases in use and or levels of physical activity (Emmons et al., 1999; Leslie et al., 2000; Linenger et al., 1991; Reed and Wilson, 2006).

- **Stairwells**

The evidence from two (2+) quality studies aimed at improving the physical environment of a stairwell by physical improvements such as carpets, painting and addition of art work may lead to increases in stairwell usage in the short-term (Boutelle et al., 2001, Kerr et al., 2004).

- **School playgrounds**

The evidence from three studies (one (1++) RCT and two (2++) controlled before and after studies) suggests that colourful/fluorescent markings painted on a school playground can lead to objectively assessed increases in variables related to physical activity during playtime, such as time spent in moderate-vigorous physical activity, time spent in vigorous activity and total energy expenditure during play, in the short-term (Stratton and Leonard, 2002; Stratton, 2000; Stratton and Mullan,

2005). However, there is no evidence available to assess the effect of school playground markings on physical activity beyond 4 weeks post implementation.

- **School classrooms**

Based on one (2-) post only study with a comparison school, there is insufficient evidence to make any overall conclusions about effectiveness but the evidence available suggests that equipping a classroom with ergonomic furniture, changing classroom layout and modified teaching styles may be associated with increases in physical activity during the school day.

Included studies

Boutelle KN, Jeffery RW, Murray DM, Schmitz KH. (2001) Using signs, artwork, and music to promote stair use in a public building. *American Journal of Public Health*, 19(12): 2004-2006.

Cardon G, De Clercq D, De B, I, Breithecker D. (2004) Sitting habits in elementary schoolchildren: a traditional versus a "Moving school". *Patient Education & Counseling*, 54(2):133-142.

Emmons KM, Linnan LA, Shadel WG, Marcus B, Abrams DB. (1999) The Working Healthy Project: a worksite health-promotion trial targeting physical activity, diet, and smoking. *Journal of Occupational & Environmental Medicine*, 41(7):545-555.

Kerr NA, Yore MM, Ham SA, Dietz WH. (2004) Increasing stair use in a worksite through environmental changes. *American Journal of Health Promotion*, 18(4):312-315.

Leslie E, Fotheringham M, Veitch J, Owen N. (2000) A university campus physical activity promotion program. *Health Promotion Journal of Australia*, 10(1):51-54.

Linenger JM, Chesson CV and Nice DS. (1991) Physical fitness gains following simple environmental change. *American Journal of Preventive Medicine*, 7(5):298-310.

Reed JA, and Wilson DK. (2006) Awareness and use of a university recreational trail. *Journal of American College Health* 54(4):227-230.

Stratton G and Leonard J. (2002) The effects of playground markings on the energy expenditure of 5-7 year old school children. *Pediatric Exercise Sciences*, 14:170-180.

Stratton G and Mullan E. (2005) The effect of multicolour playground markings on children's physical activity level during recess. *Preventive Medicine*, 41:828-833.

Stratton G. (2000) Promoting children's physical activity in primary school: an intervention study using playground markings. *Ergonomics*, 43(10):1538-1546.

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ISBN 978-1-4731-2913-9