

**An investigation of the use of pedometers to promote
physical activity, and particularly walking, among
school-aged children**

Review of evidence and scoping study

Report to Paths to Health and the Scottish Health Promoting Schools Unit

Jo Inchley, Lynn Cuthbert & Marian Grimes

**Child and Adolescent Health Research Unit
The University of Edinburgh**

May 2007



Acknowledgements

The research team is very grateful to all those who took the time to contribute information to the project, particularly in light of the short time-scale of the project at a busy time of the school year. This work was supported by Paths to Health and the Scottish Health Promoting Schools Unit.

This report has been published by the Child and Adolescent Health Research Unit (CAHRU), The University of Edinburgh.

Further information is available from:

Jo Inchley
Child and Adolescent Health Research Unit
University of Edinburgh
St Leonard's Land
Holyrood Road
Edinburgh EH8 8AQ
e: Jo.Inchley@ed.ac.uk

Contents

	<i>Page</i>
Summary of key findings	3
Background to the research	5
PART 1: Literature Review	6
• Description of Pedometers	6
• Pedometers as a measurement tool	7
• Pedometers as an intervention tool	9
• Use of the internet in health-related interventions	12
• Conclusions	14
• References	15
PART 2: Scoping Study	20
• Introduction	20
• Methods	20
• Survey respondents	22
• Pedometer use	23
• Project participants	28
• Organisation and implementation	29
• Evaluation	31
• General reflections and future plans	33
• School visits	36
• Conclusions	37
PART 3: Case Studies	39
• Stonelaw High School, Rutherglen	39
• Active Schools nan Eilean Siar Walking Challenge	42
• Youth Sport Trust ‘ <i>Schools on the Move</i> ’ pilot project	46
Appendix	52

Summary of key findings

This section provides a summary of the main findings from an investigation of the use of pedometers to promote physical activity among children and adolescents. It is based on a (non-systematic) review of published research in this area and a scoping study of current pedometer projects, primarily within Scotland.

- Pedometers provide an accurate, objective, low-cost measure of physical activity. They have been shown to be valid and reliable for use with children and adolescents.
- Pedometers are easy to use and provide immediate feedback on levels of physical activity, reported as step counts.
- They are limited by their inability to (a) measure swimming, cycling and other forms of non-ambulatory activity such as lifting or pushing and (b) discriminate between different intensities of activity.
- When used to estimate habitual physical activity in children and adolescents, at least 4-5 days of monitoring is required.
- Research suggests that pedometers can facilitate increased physical activity among children and adolescents although evidence is lacking in relation to sustainability of impact.
- Pedometers are most effective as a motivational tool when feedback is used in conjunction with individualised goal-setting and self-monitoring techniques. Among children and young people, additional support such as teacher encouragement, parental involvement and/or provision of equipment and opportunities to be active may also be required to promote behaviour change.
- Recommended daily steps are 15,000 for boys and 12,000 for girls although further research is required to confirm the appropriateness of these goals, especially among the adolescent age group.
- Step goals should be personalised taking into account an individual's baseline value, specific health goals and sustainability of the goal in everyday living. An absolute step target may be de-motivating if it appears unachievable.
- Pedometers can also be a useful tool for integrating physical activity across the school curriculum, for example, in science, maths, English, physical education and health education.
- Internet interventions have been shown to be an acceptable, feasible and effective tool for promoting physical activity.

- Interactive technologies can be particularly useful as an intervention tool because of their ability to provide personalised, tailored feedback. Individual tailoring appears to be more effective than generic information in encouraging actual behaviour change.
- Using psychological and behaviour change theory to guide computer-tailored interventions enhances efficacy.
- Further research is required to determine the effectiveness of combined pedometer and web-based interventions in children and adolescents.
- A total of 37 pedometer projects across Scotland were identified and included in the scoping study. Projects represented a wide variety of types, locations, lengths, intensities and levels of sophistication and were managed and delivered by a range of organisations.
- Aims of the projects were mostly behavioural (to increase activity), but many also included educational components (to raise awareness of and/or change attitudes towards exercise or to develop knowledge and skills across a range of subject areas).
- There was general agreement that pedometers were useful as enjoyable, motivational tools, which could be effective in increasing both activity levels and awareness of the need for activity among pupils – particularly within short-term projects.
- Pedometers also provided an incentive to engage with other activities, for example, Walk to School Week, health weeks and Eco Schools initiatives.
- Some schools used pedometers to promote competition, for example, inter-class step competitions. Others felt that an advantage of pedometers was that they were non-competitive and allowed participants to use them privately, at their own speed and without feeling incompetent.
- In general, pedometer projects proved to be time-consuming for staff involved and the commitment and enthusiasm of individual teachers was considered critical to their success.
- Several projects reported practical problems such as breakages, unreliable counts and the fact that the pedometers could be easily lost. All these issues were demotivating for pupils. Cheaper models proved particularly problematic.
- The issue of sustainability was widely recognised, particularly in terms of maintaining interest and impact among pupils over time.
- Guidance for schools is required specifically in relation to the following: type of pedometer to use; recommended timescales for projects; support for teachers; sustaining engagement; appropriate step goals; how to use step count data; and opportunities to integrate within the curriculum.

Background

The positive health benefits of physical activity among children and adolescents are well established. Recent concerns over rising levels of obesity and the link with increasingly sedentary lifestyles^a, has highlighted the need for schools and other relevant organisations to provide opportunities for children and young people to increase their activity levels. Levels of physical activity decrease during the early adolescent years, particularly among girls. Girls of this age tend to drop out of organised sports activities and competitive team games. Opportunities which enable young people to be active in a non-threatening, fun and social environment may provide a useful alternative. Walking interventions are one such opportunity. They allow participants to increase their physical activity levels without the need for specific skills, equipment or facilities. Walking can be integrated into young people's lives in a number of different contexts including transportation, recreation and education.

In this context, there has been increased interest in using pedometers as a motivational tool to promote physical activity. Pedometers are seen as a useful device because they are relatively cheap, non-invasive, easy to use and provide immediate personalised feedback. They are now being widely used in schools and other youth settings but there is currently little evidence available to demonstrate their effectiveness or to inform guidance on best practice.

A multi-agency group has been established to consider (a) the evidence for pedometer use among school-aged children and (b) the potential to engage low active girls in physical activity through walking-based interventions. This group includes representatives from the Child and Adolescent Health Research Unit (CAHRU) at Edinburgh University, Heriot Watt University, the Scottish Physical Activity Research Collaboration (SPARColl), the Scottish Health Promoting Schools Unit, Paths to Health, Sustrans, Sportscotland and the Youth Sport Trust. Current demand for, and use of, pedometers across Scotland is increasing. In order to meet the need for an evidence base to inform best practice guidance and to identify examples of current use across the UK, CAHRU was commissioned to undertake an initial review of literature and a scoping study of current pedometer interventions within Scotland and across the UK.

The study was conducted over a period of eight weeks during March and April 2007. This report presents findings from the literature review and scoping study and also includes three case studies which provide more in-depth detail about specific pedometer-based interventions within the UK. It is anticipated that findings from this report will be used to inform the development of some preliminary guidance for schools on the use of pedometers to promote physical activity, and particularly walking, among school-aged children.

^a Department of Health (2004) At least five a week: Evidence on the impact of physical activity and its relationship to health. London: Department of Health.

PART 1: Literature Review

The aims of the literature review were to review existing evidence of:

- Walking interventions among children and adolescents
- Pedometer use among children and adolescents as (a) an intervention tool, and (b) a physical activity measurement tool
- Web-based health-related interventions among adolescents, especially those relating to physical activity
- Web-supported walking interventions among the general population

The following databases were searched for relevant papers: Medline, Web of Knowledge (SCI and SSCI), ScienceDirect, ERIC, Physical Education Index, ASSIA and PsycINFO. The search was undertaken using combinations of the following terms: walk or walking, pedometer(s), intervention(s), and internet. The search period was limited to between 1990 and 2007 and to English language papers only. Inclusion criteria comprised reports of data from original studies and review articles. All searches were filtered for studies relevant to children and adolescents. Further relevant studies were identified through the reference lists of papers included in the review.

In addition to a search of relevant databases, an email request was sent to the five international advisors to the Scottish Physical Activity Research Collaboration (SPARColl)^b in order to identify any existing interventions or evaluations which may not yet have been published. No additional evidence was identified through this process.

Description of Pedometers

Pedometers can provide an accurate, objective and low-cost measure of walking behaviours. Mechanical pedometers have been available for several hundred years and their design has been attributed to Leonardo da Vinci¹. Nowadays, electronic pedometers are widely available. These are small, battery-operated motion sensors that use a spring-suspended lever arm to detect vertical movement during ambulation e.g. walking². During activity, each single vertical movement - or step - is recorded and displayed on a feedback screen. Some pedometers also allow for calculation of distance travelled and energy expenditure (kcal), based on individual step length and body mass respectively, but these outputs are generally less reliable. In comparing step count or distance outputs, it is important to be aware of the effect of stride length on each. For example, over the same distance, those with shorter stride lengths will accrue a greater number of steps than those with a longer stride length. Similarly, for the same amount of steps, those with a longer stride length will have travelled a greater distance than those with a shorter stride length. This should be taken into account when comparing steps and/or distances between individuals.

^b The five international SPARColl advisors are: Prof Adrian Bauman (University of New South Wales), Prof James Sallis (San Diego State University), Prof Billie Giles-Corti (University of Western Australia), Prof Pekka Oja (UKK Institute, Finland) and Prof Sally MacIntyre (University of Glasgow).

Pedometers can be used to monitor physical activity levels by counting the numbers of steps taken and relating the count to guideline equivalents of physical activity. In healthy adults, the generally accepted number of steps to meet public health guidelines of 30 minutes of moderate physical activity a day is 10,000³ and some have suggested that at least 15,000 steps a day may be necessary to achieve weight loss goals⁴. It is acknowledged that requirements are likely to be higher for children and adolescents but little work has been undertaken to date to establish the appropriate number of daily steps among this age group. In a study of 78 boys aged 11-13 years, Jago and colleagues found that the mean number of steps accumulated during a fast walk was 127 per minute⁵. On this basis, they proposed a conservative estimate of 8000 steps as equivalent to the current recommended level of physical activity of 60 minutes per day. However, based on an international sample, Tudor-Locke and colleagues have proposed cut-points for 6-12 year olds of 15,000 steps for boys and 12,000 steps for girls⁶. A number of studies have been undertaken to assess pedometer-determined physical activity levels in children and several have reported that children accumulated on average between 12,000 and 16,000 steps a day^{7,8}. A recent study of British primary schoolchildren found that mean steps per day were 12,263 (+/- 3,789) for boys and 11,748 (+/- 3,310) for girls, thus suggesting that the majority of boys and girls are not meeting the recommended number of daily steps⁹.

Pedometers as a measurement tool

Valid assessment of physical activity is important for both research and intervention purposes. Traditionally, self-report measures have been the preferred option for use among large populations because they are relatively easy to administer and can provide in-depth information on behaviour and related contextual factors. However, they have a number of well-known limitations including recall bias and the diversity of definitions, measures and outputs used which make it difficult to compare findings across studies. Typically, objective measures of physical activity, while providing more accurate data, are more restricted in terms of the depth of information gathered and more expensive to buy and administer. Pedometers overcome a number of these limitations; they provide an objective measure of physical activity which is cheap and easy to administer, and produce a user-friendly output (step counts).

Validity is defined as the extent to which an instrument measures what it purports to measure¹⁰. Reviews by Tudor-Locke and colleagues^{10,11} have provided support for pedometers as a valid tool for measuring physical activity. Based on a review of 25 studies published since 1980¹¹, pedometers were found to show strong correlations with data from accelerometers during unrestricted movement and with time spent in observed activity. Pedometer data also showed a moderate correlation with energy expenditure measurements including heart rate estimates and indirect calorimetry. Correlation with self-reported physical activity varied according to the type of self-report instrument used and the type of physical activity being assessed. In addition, a further review of 29 studies¹⁰ showed inverse relationships between pedometer-determined physical activity and body mass index (BMI) and indicators of body fatness i.e. lower step counts among those with higher BMI or greater percentage body fat. Positive associations were found with indicators of fitness measures, for example, a 6-minute walk test and treadmill tests.

The general consensus is that because pedometers are easy to use, inexpensive and have good comparability with other measurements of physical activity, they are an ideal tool for measuring physical activity. However, it is important to note a number of limitations. Pedometers do not provide information about the type or patterns of movement and cannot be used to measure activities such as swimming or cycling as these activities produce little movement on the vertical plane. They cannot discriminate between steps accumulated in walking, running or climbing stairs; thus their ability to predict energy expenditure is limited as they assume that a person expends a constant amount of energy per step. As with accelerometers, they also cannot detect arm movements or energy expended through pushing, lifting or carrying objects. Validity is compromised in the obese, frail elderly and those with gait abnormalities. The measurement of slow walking is also problematic for pedometers as they are not sensitive enough to pick up such little movement^{9,11,12}.

Jago et al.⁵ assessed validity and reliability of pedometers among a sample of 11-15 year old boys. They found significant correlations between pedometer and accelerometer data and also concluded that the number of pedometer counts recorded by adolescents under field (non-laboratory) conditions provided a reliable estimate of physical activity. Step counts showed some variation by adiposity but this was attributed to the fact that the heavier boys were more likely to be taller and therefore required fewer steps to cover the same distances as their shorter peers. Because this study was conducted with adolescent boys, the findings may not be applicable to girls and younger children.

A number of studies have been undertaken to compare the accuracy of different types of pedometer for research purposes^{13,14,15}. Of the various brands and models available, the Yamax Digi-Walker is generally accepted as one of the most accurate and reliable^{16,17}. In a comparison of 13 different pedometers, two models of the Yamax Digi-Walker (SW-200 and SW-701) were among four pedometers identified as most suitable for research purposes¹⁵. The SW-200 model has also been found to be reliable among children aged 7-10 years¹⁸ and 10-14 years¹⁶. These models retail at around £15-£20 per unit^c. If other types of pedometers are used, it is advised that they be validated before use by comparing recorded steps counts against the observed number of steps undertaken at normal walking pace over a given distance⁷. Vincent and Sidman¹⁹ assessed pedometer measurement error by undertaking a 100-step walk test and found that none of the pedometers tested exceeded an error of 5% (i.e. 5 steps out of 100). Researchers and practitioners should expect similar error when validating their own pedometers using similar methods².

Two other issues to be considered when using pedometers as a measurement tool are (a) the time-frame used for monitoring and (b) data recording procedures. In relation to an appropriate timeframe for collecting pedometer data, one needs to consider the amount of time required to provide confident estimates of habitual physical activity in the intended target group⁷. This is only an issue when pedometers are used to provide a measure of total activity rather than as an intervention tool. The number of days recording required to give an accurate estimate of habitual physical activity will depend on the target population and the extent to which daily physical activity patterns vary with that population. Groups with low variability in steps per day, for

^c <http://www.digiwalker.co.uk/homepage.cfm>

example, may only need a few days monitoring to provide an accurate daily mean. However, among children and young people, daily patterns of physical activity tend to be less well established and there is known variation between weekdays and weekends. Therefore, monitoring timeframes need to take this into account. According to Bassett & Strath²⁰, a common approach is for participants to wear a pedometer for a full week and then average the results. This reduces measurement variability and accounts for differences between weekdays and weekends. Rowe et al.¹⁶ found six days of pedometer data to be adequately reliable for research into habitual physical activity among early adolescents but others have used a shorter monitoring period of 4-5 days^{21,22}.

Data recording can also be undertaken in a variety of ways. Pedometer readings may be recorded by the researcher or practitioner, or by the participant themselves. In addition, step counts may be collected daily (with pedometers reset to zero each day) or accumulated over a longer period of time. The advantage of daily recordings is that they provide an indication of day-to-day variability rather than a daily average. Daily totals are typically recorded by the participants themselves and a range of tools such as logs or calendars can be provided to facilitate data collection. In some studies, pedometers may be sealed in order to 'blind' the participant to the pedometer readings and the research output is a single value based on the number of steps accumulated over several days. In such cases, the number of days available for recording will be limited by the memory capacity of the pedometer itself. Using sealed pedometers may help to overcome problems of reactivity which occur when the testing process itself (i.e. wearing a pedometer) influences behaviour²³.

Pedometers as an intervention tool

In order to maximise opportunities to engage children and adolescents in physical activity programmes, there is a need to identify strategies to motivate children to develop and maintain physical activity behaviours²¹. Research on determinants of physical activity in children and adolescents indicates that interventions should focus on developing perceptions of competence, promoting enjoyment and providing social support²⁴. Pedometers are increasingly being used as a motivational tool in programmes or interventions to promote physical activity among children and young people. Individuals are able to use their pedometer to self-monitor their daily activity levels (step counts), set personalised goals and received immediate feedback. Pedometers are ideal for this purpose as they are sensitive to walking behaviour, generally acceptable to participants, inexpensive and allow for easy data management²⁵. Feedback that is specifically tailored for an individual can be very effective in promoting physical activity²⁶. Feedback can also help to enhance competence perceptions by providing information on physical achievements^{24,27}. Evidence suggests that, when used in combination with goal-setting strategies and/or additional support, feedback can act as an important motivational tool to increase physical activity. As well as providing feedback, pedometers can also act as an environmental cue (reminder to be active).

Butcher et al.²¹ investigated the effects of feedback on daily step counts among primary schoolchildren (mean age 9 years). Children were divided into three groups: (1) control group who wore sealed pedometers, (2) feedback group who wore unsealed pedometers and recorded their daily steps on personalised record sheets, and

(3) feedback plus information group who wore unsealed pedometers, recorded their daily steps on personalised record sheets, and received information and ideas on how they could increase their physical activity. All groups wore a pedometer during one school week. Results showed that the group who received information in addition to feedback accumulated more steps than the other two groups, suggesting that feedback alone may not be sufficient to increase physical activity. However, no attempt was made to monitor whether these effects were sustained over a longer time period.

Among adult female health care workers, pedometers were found to be most effective in increasing self-efficacy and physical activity behaviour when used in association with self-monitoring techniques and daily goal setting²⁸. Monitoring daily activity usually involves completing an activity log book with the number of steps taken and the strategies used to increase activity for that day. Other studies also suggest that goal setting and monitoring are effective approaches for increasing physical activity among adults²⁹. Goal setting involves establishing a realistic and attainable target and identifying strategies for achieving the set target. Evidence indicates that using self-referenced goals may be more effective than encouraging participants to reach a specific number of steps which may be seen as unachievable. Self-referenced goals are based on increasing an individual's daily steps by a certain amount, for example 5% or 10%, relative to their previous level of activity. No studies were found which compared the effectiveness of absolute versus relative step goals among children and adolescents. However, it is important that, if goals are set, they are seen as achievable and are likely to be sustainable over time.

A recent systematic review of interventions to promote walking identified only one pedometer-based intervention that involved school-aged children³⁰. This intervention, in Australia, targeted low-active adolescent girls aged 15-18 years³¹. Pedometers were used because they were seen as novel and non-threatening motivational devices to engage girls. Girls were assigned to one of three groups - a control group, a 'pedometer intervention' group, or a 'minutes intervention' group – and were followed up over a period of 12 weeks. Girls in the intervention groups were encouraged to increase their physical activity by setting either step count (pedometer group) or time-based (minute group) goals throughout the intervention. Both groups also attended weekly meetings for the first six weeks and received a personal log book plus information about how to be more active. Results showed that both intervention groups significantly increased their physical activity during the 12 weeks while there was no change over time in the control group. The 'pedometer' group showed a greater increase in step counts than the 'minutes' group at mid-intervention (6 weeks) but this difference was not sustained after 12 weeks. Overall, the pedometer intervention group had an average increase of 2747 steps per day over the 12-week period suggesting that pedometers may be an effective way of increasing physical activity among low-active girls, at least in the short term.

Physical activity programmes aimed at children and adolescents may take place in a variety of settings including home, school and / or community. Schools have been among the most widely used³¹. Young people spend a large proportion of their time at school and much of school time is structured around sedentary activities within the classroom. Despite this, schools can provide a range of opportunities to promote physical activity through physical education, other classroom activities, break times, travel to and from school, and after-school clubs.

An area of particular interest is the potential for integrating pedometer use with curriculum content in schools, which can serve both behavioural and educational goals³². Pedometers can be particularly useful in this instance as there is an actual observed count of physical activity which can be used not only in physical education but across a wide range of other subjects. Oliver and colleagues³² investigated the feasibility of using pedometers as a means of integrating physical activity across the school curriculum. Such an approach is seen as holistic, drawing on a broad base of disciplines in order to develop knowledge and skills and create a meaningful learning experience³³. The study was undertaken among 8-10 year olds in one primary school in New Zealand. All children wore pedometers continuously throughout the 4-week intervention period and daily average step-counts were used to calculate the distance ‘virtually travelled’ across New Zealand. This data was then used within different curricular subjects where pupils would participate in physical activity, explore physical activity themes or learn about the cities they had ‘walked’ to. Subjects included English, social studies, maths, statistics and PE. The intervention had no effect on physical activity levels within the sample as a whole, but a significant increase in daily steps was found among the least active children and this effect was greater among girls.

Previous research has suggested that pedometers can be used to foster innovative learning about science, maths and technology within informal educational settings^{34,35}. Rye and colleagues³⁶ investigated teachers’ experiences of using pedometers within after-school science and math clubs. Teachers were trained and provided with support materials and resources. Examples of some the activities undertaken are a Frisbee basketball game, a writing activity by students about ways to increase their physical activity levels, investigating kilocalorie expenditure, experiments to test factors that may affect step-counts and step-count challenges. Almost half of the teachers responded that the activities had gone well, although some reported problems associated with placement of the pedometers and students inflating their step-counts. Specific learning outcomes identified by teachers included: increased awareness of the importance of healthy lifestyles, specifically in relation to energy balance; knowledge of ways to increase physical activity; and mathematical skills such as producing spreadsheets and graphs. Professional development of teachers is seen as essential to sustainability of pedometer-based interventions in schools. According to Rye et al.³⁶, *“the introduction of pedometers needs to be accompanied by innovative and substantive professional development where teachers engage in activities that illustrate the breadth and depth of this technology resource for instruction as well as the potential benefits to health”*.

While the school environment can be an ideal setting for physical activity programmes, walking interventions have the advantage of being adaptable to most environments. The home environment is considered to be one of the most important influences on children’s physical activity behaviour³⁷. Parents can influence on children’s physical activity through a range of support mechanisms including encouragement, observation, financial support and providing transportation³⁸. Thus, families are an important context for physical activity interventions³⁹. Little research has been undertaken to investigate family-based pedometer interventions in particular, but evidence does suggest that involving parents in interventions to promote physical activity among children and adolescents can be an effective strategy^{40,41}.

Use of the internet in health-related interventions

Rapid technological advances have widened the scope for delivery of educational and behavioural interventions and the internet is increasingly being seen as a potential behaviour modification tool. Estimates suggest that as many as 75% of adolescents have used the internet to locate health information online^{42,43}. Interventions that use media in any format, as opposed to location-based interventions, are ideal for communicating to large populations in an efficacious yet cost-effective manner⁴⁴ and evidence suggests that computer-tailored interventions can be an acceptable, feasible and effective tool for promoting physical activity⁴⁵. Interventions that include audio, graphics and interactivity are more likely to be effective in behaviour change than those without⁴⁶. Computer-based interventions “mimic the reasoning of human experts by basing their feedback in decision rules that are predetermined by qualified professionals based on theories or models of behaviour change”⁴⁴.

Internet interventions typically focus on behaviour change and are self-paced, interactive and tailored to the user⁴⁷. Interventions delivered via the internet also have a number of potential advantages over other modes of delivery including reach, accessibility and low cost. Although a relatively new field of investigation, existing studies of web-based interventions for a range of health outcomes lend some support to their feasibility and effectiveness⁴⁷. A study evaluating a combined smoking cessation programme and internet aided instruction among adolescents found that the participants valued the ability to retrieve useful information and share experiences with peers online⁴⁸. Using a web-based nutrition education programme with adolescents was found to increase self-efficacy for healthy eating when compared with standard classroom instruction but had no effect on eating behaviour⁴⁹. Adding email reminders during an intervention has been shown to encourage further visits to the website⁵⁰ and to further aid the effectiveness of an internet intervention⁵¹.

There is evidence to suggest that web-based interventions may be a viable option for physical activity promotion. Targeting information based on the individual’s stage of motivational readiness can significantly increase physical activity behaviour, by tailoring the message content and basing it on the individual’s assessment data, making the individual more likely to read the message and retain the information⁴⁴. A controlled trial of a physical activity internet intervention, aimed at the general adult population, accomplished an increase in active transportation and in leisure-time physical activity, and also significantly improved moderate-to-vigorous physical activity in insufficiently active adults⁵². The website provided tailored physical activity information based on an assessment questionnaire completed by the participant and, drawing on the Transtheoretical Model, delivered advice according to the appropriate stage of change the participant was assessed to be in. Stage-based computer-tailored interventions have also shown to be effective in increasing physical activity levels in adolescents^{53,54}.

A community-based intervention involving boy scouts used a combination of group activities and internet-based role modelling, goal setting, goal review and problem-solving to successfully increase light intensity physical activity and decrease sedentary behaviour, but there was no effect on moderate-to-vigorous physical activity⁵⁵. Retention of boys in this intervention was associated with parental

education, suggesting that more needs to be done to ensure equitable engagement across all social groups. Internet-based physical activity interventions have also been shown to be effective within the school setting. A study in Belgium combined environmental strategies with computer-tailored feedback to promote levels of moderate-to-vigorous physical activity among 11-15 year old schoolchildren⁵⁶. Participating schools were provided with an “intervention box” containing sports equipments which was made available to students during break times and after school. Additional opportunities for physical activities were organised by the school, and the computer-tailored intervention was delivered in class to provide personal advice and promote active lifestyles. In some schools, parents were also involved in the intervention. After nine months, the intervention was successful in enhancing school-related physical activity but had no effect on leisure time activity.

Most internet interventions suffer from a decline in usage after the first few weeks of the intervention⁵¹. A randomised trial looking at retention of adult participants in an online physical activity intervention found that simply providing website access and using email prompts did not appear to give sufficient incentive for people to view the website⁵⁷. Spittaels et al.⁵² also reported a high drop-out rate among participants, again illustrating problems of engagement and retention. Among children, a study of a combined nutrition and physical activity intervention found only modest engagement with the web-based component of the intervention⁵⁸. A number of barriers to engagement were identified including: lack of time, lack of awareness, forgetfulness, lack of interest and access problems.

In developing a tailored, internet-based intervention to adolescents, Meis and colleagues⁵⁹ highlight the need for continuous site maintenance : *“Implementing fresh design and content as well as keeping up with technological advances in computer software and hardware will be necessary in order to present a site that remains interesting to an adolescent user”*. In addition, the target group should have a key role in determining content and design choices. Other guidelines suggested include: the use of direct, clear and non-judgemental language, which should be informal without trying to impersonate adolescents; using pictures rather than text wherever possible; and using specific examples rather than abstracted ideas. However, new technologies may not necessarily be more effective for delivery of interventions than traditional methods of communication. A randomised control trial compared web-based content versus print-based material to promote self-efficacy, intentions and physical activity among adolescent girls. The results showed that, when form and content were held constant, print-based material was more effective at increasing physical activity intentions and behaviour than web-based material⁴².

A key component of internet interventions is interactivity, through which personalised feedback can be provided based on data supplied by an individual²⁶. Pedometers are a useful tool for collecting physical activity data, as described previously, and users can simply enter the data by viewing the screen and typing the numbers directly into the website. In addition, some pedometers have the facility to upload the data directly onto a computer. This can relieve the burden of completing daily logs and increases the detail and accuracy of the data⁶⁰. Pedometer step-counts can be used, in combination with short descriptions about usual activity behaviours and personal data (e.g. height, weight, etc), by the website to generate information and tips that are specifically tailored for the user. An additional advantage of using the internet in a

pedometer intervention is that minimal training and technical support is required, with little one-on-one contact after the initial training and orientation ⁶⁰.

Among adults, web-based programmes have been used in conjunction with pedometers to increase physical activity behaviour. One study among patients at high risk of cardiovascular disease used the internet to display personalised graphs of daily step-counts along with motivational messages ⁶⁰. The website was also used in conjunction with face-to-face sessions for diet and physical activity counselling where a facilitator helped set appropriate step goals. Daily step-counts were significantly increased and participants found viewing the graphs helpful in visualising their step-count targets. A similar study among sedentary adult workers used pedometers as a motivational device to promote walking and associated health benefits ⁶¹. A website was developed specifically for the study to enable participants to record daily totals and monitor progress. On average, participants increased their step-counts by over 3,400 steps per day.

There is very little evidence on the effectiveness of the combined use of pedometers and the internet among children and adolescents. A randomised controlled trial of a combined activity monitor and computer-tailored physical activity intervention is being conducted among adolescents and young adults in the Netherlands ⁴⁵ but the findings from this study have not yet been reported. Similarly, an “internet-enabled futuristic adventure game” has been designed to promote physical activity and healthier food choices among children aged 9-11 ⁶². This intervention involves random allocation of children to either an intervention (game) group or a control group for a 4-week period. Children in the intervention group upload their daily steps onto a computer and these are converted into ‘energy units’ which are required in order to play the game. There are also quizzes and tasks that are used to increase the children’s knowledge about nutrition and fitness. Parents are responsible for uploading the data to the internet and also for recording the children’s food intake and their TV watching, which was also entered into the website. Although full findings from this study have not yet been published, a preliminary pilot study found a 10% increase in physical activity and 29% reduction in TV watching during the two weeks children played the game ⁶³.

Marcus et al. ²⁶ identify a wide range of factors which need to be considered in the development of computer-tailored interventions including: which variables to use for tailoring (e.g. literacy level, type of interface, risk perception, personality); how many variables to assess; how variables combine to influence behaviour change; personal variables such as communication style and cognitive processing; delivery method; relevant models of behaviour change for specific target group(s); and respondent burden. Much has still to be learned about many of these factors and how they might be used most effectively to promote behaviour change within specific populations.

Conclusions

Walking interventions may be an ideal way of engaging children and adolescents who are less interested in traditional team games and organised sports. Walking can be a sociable activity and requires no specialist equipment or resources. It can take place during the school day, the journey to and from school and young people’s leisure time. Pedometers are particularly well-suited to walking-based interventions as both a

measurement and motivational tool. They are valid, novel, inexpensive and easy-to-use. There is very little evidence of the effectiveness of walking interventions among school-aged children, but a number of studies have shown pedometers to be an effective tool in increasing physical activity levels. Daily step-counts can raise awareness of current physical activity levels, provide immediate feedback for the user and enable monitoring of change over time. Setting goals relative to an individual's previous step counts is likely to be more effective than encouraging children and adolescents to reach a specific number of daily steps which may be seen as unachievable. The user's stage of motivational readiness for change can further enhance personalised feedback and aid in setting achievable goals for increasing physical activity. Effectiveness also appears to be enhanced when additional support, such as encouragement from teachers or opportunities to be active, is provided alongside feedback.

Internet interventions have been shown to be an acceptable, feasible and effective tool for promoting physical activity among adults and, to a lesser extent, among children and adolescents. Web-based pedometer interventions would appear to hold considerable promise for increasing physical activity because of their ability to provide individualised feedback, monitoring and goal setting. The internet also provides a cost-effective means of delivering advice and communicating behavioural strategies to large populations without the need for face-to-face contact. Effective use of the internet, however, is dependent on participants having regular access to computers and the computers themselves having sufficient speed and storage capacity to facilitate 'real time' interaction. In addition, the problems of engagement and retention which have been identified by a number of studies need to be addressed.

References included in the literature review

1. Gibbs-Smith C. *The Inventions of Leonardo da Vinci*. Phaidon Press, London, 1978.
2. Tudor-Locke C. Taking Steps Toward Increased Physical Activity: Using Pedometers to Measure and Motivate *PCPFS Research Digests*. Washington D.C.: President's Council on Physical Fitness and Sports, 2002.
3. Tudor-Locke C, Bassett DRJ. How many steps/day are enough? Preliminary pedometer indices for public health. *Sports Medicine* 2004; 34(1): 1-8.
4. Leermakers EA, Dunn AI & Blair SN. Exercise management of obesity. *Medical Clinics of North America* 2000; 84(2): 419-440.
5. Jago R, Watson K, Baranowski T, Zakeri IE, Sunmi YM, Baranowski JC, et al. Pedometer reliability, validity and daily activity targets among 10-to 15-year-old boys. *Journal of Sports Sciences* 2006; 24(3): 241-251.
6. Tudor-Locke C, Pangrazi RP, Corbin CB, Rutherford WJ, Vincent SD, Raustorp A, et al. BMI-referenced standards for recommended pedometer-determined steps/day in children. *Preventive Medicine* 2004; 38(6): 857-864.
7. Tudor-Locke C & Myers AM. Methodological considerations for researchers and practitioners using pedometers to measure physical (ambulatory) activity. *Research Quarterly for Exercise and Sport* 2001; 72(1): 1-12.
8. Rowlands AV, Eston RG & Ingledeew DK. Relationship between activity levels, aerobic fitness and body fat in 8- to 10-year old children. *Journal of Applied Physiology* 1999; 86: 1428-1435.

9. Duncan MJ, Al-Nakeeb Y, Woodfield L, Lyons M. Pedometer determined physical activity levels in primary school children from central England. *Preventive Medicine* 2007 (in press).
10. Tudor-Locke C, Williams JE, Reis JP, Pluto D. Utility of pedometers for assessing physical activity - Construct validity. *Sports Medicine* 2004; 34(5): 281-291.
11. Tudor-Locke C, Williams JE, Reis JP, Pluto D. Utility of pedometers for assessing physical activity - Convergent validity. *Sports Medicine* 2002; 32(12): 795-808.
12. Beets MW, Patton MM, Edwards S. The accuracy of pedometer steps and time during walking in children. *Medicine and Science in Sports and Exercise* 2005;37(3):513-520.
13. Bassett DR, Ainsworth BE, Leggett SR, Mathien CA, Main JA, Hunter DC & Duncan GE. *Medicine and Science in Sports and Exercise* 1996; 28: 1071-1077.
14. Schneider PL, Crouter SE, Lukajic O & Bassett DR Jr. Accuracy and Reliability of 10 Pedometers for Measuring Steps over a 400-m walk. *Medicine and Science in Sports and Exercise* 2003; 35(10): 1779-1784.
15. Schneider PL, Crouter SE & Bassett DR Jr. Pedometer measures of free-living physical activity: comparison of 13 models. *Medicine and Science in Sports and Exercise* 2004; 36(2): 331-335.
16. Rowe DA, Mahar MT, Raedeke TD & Lore J. Measuring Physical Activity in Children with Pedometers: Reliability, Reactivity and Replacement of Missing Data. *Pediatric Exercise Science* 2004; 16: 343-354.
17. Le Masurier GC, Lee SM, Tudor-Locke C. Motion sensor accuracy under controlled and free-living conditions. *Medicine and Science in Sports and Exercise* 2004; 36(5): 905-10.
18. Barfield JP, Rowe DA & Michael TJ. Interinstrument Consistency of the Yamax Digi-Walker Pedometer in Elementary School-Aged Children. *Measurement in Physical Education and Exercise Science* 2004; 8(2): 109-116.
19. Vincent SD & Sidman CL. Determining Measurement Error in Digital Pedometers. *Measurement in Physical Education and Exercise Science* 2003; 7(1): 19-24.
20. Bassett Jr DR & Strath SJ. Use of Pedometers to Assess Physical Activity. In: GJ Welk (Ed) *Physical Activity Assessments for Health-Related Research*. Human Kinetic Publishers Inc., 2002.
21. Butcher Z, Fairclough S, Stratton G, Richardson D. The effects of feedback and information on children's pedometer step counts at school. *Pediatric Exercise Science* 2007; 19: 29-38.
22. Beighle A & Pangrazi RP. Measuring Children's Activity Levels: The Association Between Step-Counts and Activity Time. *Journal of Physical Activity and Health* 2006; 3: 221-229.
23. Vincent SD & Pangrazi RP. Does reactivity exist in children when measuring activity levels with pedometers? *Pediatric Exercise Science* 2002; 14: 56-63.
24. Weiss MR, Corbin C & Pangrazi B. *Motivating Kids in Physical Activity*. President's Council on Physical Fitness and Sports Research Digest Series 3, No. 11. September 2000.
25. Tudor-Locke CE & Myers AM. Challenges and Opportunities for Measuring Physical Activity in Sedentary Adults. *Sports Medicine* 2001; 31(2): 91-100.
26. Marcus BH, Nigg CR, Riebe D, Forsyth LH. Interactive communication strategies: implications for population-based physical-activity promotion. *American Journal of Preventive Medicine* 2000;19(2):121-6.

27. Rooney BL, Gritt LR, Havens SJ, Mathiason MA & Clough EA. Growing healthy families: family use of pedometers to increase physical activity and slow the rate of obesity. *Wisconsin Medical Journal* 2005; 104(5): 54-60.
28. Rooney BL, Smalley K, Larson J, Havens SJ. Is Knowing Enough? Increasing Physical Activity by Wearing a Pedometer. *Wisconsin Medical Journal* 2003; 102(4): 31-36.
29. Croteau KA. A preliminary study on the impact of a pedometer-based intervention on daily steps. *American Journal of Health Promotion* 2004; 18(3): 217-20.
30. Ogilvie D, Foster C, Rothnie H, Cavill N, Hamilton V, Fitzsimons C & Mutrie N. Interventions to promote walking: a systematic review. *BMJ* (in press)
31. Schofield L, Mummery WK, Schofield G. Effects of a controlled pedometer-intervention trial for low-active adolescent girls. *Medicine and Science in Sports and Exercise* 2005; 37(8): 1414-1420.
32. Oliver M, Schofield G, McEvoy E. An integrated curriculum approach to increasing habitual physical activity in children: A feasibility study. *Journal of School Health* 2006; 76(2): 74-79.
33. Beane JA. Curriculum integration and the disciplines of knowledge. *Phi Delta Kappan* 1995; 76: 616-622.
34. James E, Eijkelhof H, Gaskell J, Olson J, Raizen S & Saez, M. Innovations in science, mathematics and technology education. *Journal of Curriculum Studies* 1997; 29: 471-483.
35. Katz P. *Community Connections for Science Education* Volume II. National Science Teachers Association, Arlington, VA, 2001.
36. Rye JA, Zizzi SJ, Vitullo EA, Tompkins NOH. The pedometer as a tool to enrich science learning in a public health context. *Journal of Science Education and Technology* 2005; 14(5-6): 521-531.
37. Ward DS, Saunders RP & Pate RR. *Physical Activity Interventions in Children and Adolescents*. Human Kinetics, Champaign, IL, 2007.
38. Trost SG, Sallis JF, Pate RR et al. Evaluating a model of parental influence on youth physical activity. *American Journal of Preventive Medicine* 2003; 25: 277-282.
39. Young KM, Northern JJ, Lister KM, Drummond JA, O'Brien WH. A meta-analysis of family-behavioral weight-loss treatments for children. *Clinical Psychology Review* 2007; 27(2): 240-249.
40. Ransdell LB, Taylor A, Oakland D, Schmidt J, Moyer-Mileur L & Shultz B. Daughters and Mothers Exercising Together: Effects of home- and community-based programs. *Medicine and Science in Sports and Exercise* 2003; 35(2): 286-296.
41. Taggart AC, Taggart J & Siedentop D. Effects of a home-based activity programme. A study with low fitness elementary school children. *Behavior Modification* 1986; 10(4): 487-507.
42. Marks JT, Campbell MK, Ward DS, Ribisl KM, Wildemuth BM, Symons MJ. A comparison of web and print media for physical activity promotion among adolescent girls. *Journal of Adolescent Health* 2006; 39(1): 96-104.
43. Santor DA, Poulin C, LeBlanc JC, Kusumakar V. Online Health Promotion, Early Identification of Difficulties, and Help Seeking in Young People. *Journal of the American Academy of Child and Adolescent Psychiatry* 2007; 46(1): 50-59.
44. Marcus BH, Nigg CR, Riebe D, Forsyth LH. Interactive communication strategies: implications for population-based physical-activity promotion. *American Journal of Preventive Medicine* 2000; 19(2): 121-6.

45. Slootmaker SM, Paw M, Schuit AJ, Seidell JC, van Mechelen W. Promoting physical activity using an activity monitor and a tailored web- based advice: design of a randomized controlled trial. *BMC Public Health* 2005; 5: 134.
46. Ritterband LM, Cox DJ, Gordon TL, Borowitz SM, Kovatchev BP, Walker LS, et al. Examining the added value of audio, graphics, and interactivity in an Internet intervention for pediatric encopresis. *Childrens Health Care* 2006; 35(1): 47-59.
47. Ritterband LM, Gonder-Frederick LA, Cox DJ, Clifton AD, West RW, Borowitz SM. Internet interventions: In review, in use, and into the future. *Professional Psychology: Research and Practice* 2003; 34(5): 527-534.
48. Chen HH, Yeh ML. Developing and evaluating a smoking cessation program combined with an Internet-assisted instruction program for adolescents with smoking. *Patient Education and Counseling* 2006; 61(3): 411-418.
49. Long JD, Stevens KR. Using Technology to Promote Self-Efficacy for Healthy Eating in Adolescents. *Journal of Nursing Scholarship* 2004; 36(2): 134-139.
50. McCoy MR, Couch D, Duncan ND, Lynch GS. Evaluating an internet weight loss program for diabetes prevention. *Health Promotion International* 2005; 20(3): 221-8.
51. McKay HG, King D, Eakin EG, Seeley JR, Glasgow RE. The diabetes network internet-based physical activity intervention: a randomized pilot study. *Diabetes Care* 2001; 24(8): 1328-34.
52. Spittaels H, De Bourdeaudhuij I, Vandelanotte C. Evaluation of a website-delivered computer-tailored intervention for increasing physical activity in the general population. *Preventive Medicine* 2007; 44(3): 209-217.
53. Frenn M, Malin S , Brown RL et al. Changing the tide: An internet/video exercise and low-fat diet intervention with middle school students. *Applied Nursing Research* 2005; 18: 13-21.
54. Patrick K, Calfas KJ, Norman GJ et al. Randomised controlled trial of primary care and home-based intervention for physical activity and nutrition behaviours. *Archives of Pediatric and Adolescent Medicine* 2006; 160: 128-136.
55. Jago R, Baranowski T, Baranowski JC, Thompson D, Cullen KW, Watson K, et al. Fit for Life Boy Scout badge: outcome evaluation of a troop and Internet intervention. *Preventive Medicine* 2006; 42(3): 181-7.
56. Haerens L, De Bourdeaudhuij I, Maes L, Cardon G, Deforche BI. School-Based Randomized Controlled Trial of a Physical Activity Intervention among Adolescents. *Journal of Adolescent Health* 2007; 40(3): 258-265.
57. Leslie ER, Marshall AL, Owen N, Bauman AE. Engagement and retention of participants in a physical activity website. *Preventive Medicine* 2005; 40(1): 54-9.
58. Rydell SA, French SA, Fulkerson JA, Neumark-Sztainer D, Gerlach AF, Story M, et al. Use of a Web-based component of a nutrition and physical activity behavioral intervention with Girl Scouts. *Journal of the American Dietetic Association* 2005; 105(9): 1447-50.
59. Meis TM, Gaie MJ, Pingree S, Boberg EW, Patten CA, Offord KP, et al. Development of a tailored, Internet-based smoking cessation intervention for adolescents. *Journal of Computer Mediated Communication* 2002; 7(3) (<http://jcmc.indiana.edu/vol7/issue3/meis.html>)
60. Richardson CR, Brown BB, Foley S, Dial KS, Lowery JC. Feasibility of adding enhanced pedometer feedback to nutritional counseling for weight loss. *Journal of Medical Internet Research* 2005;7(5):62-70.

61. Chan CB, Ryan DAJ, Tudor-Locke C. Health benefits of a pedometer-based physical activity intervention in sedentary workers. *Preventive Medicine* 2004; 39(6): 1215-22.
62. Southard DR, Southard BH. Promoting physical activity in children with MetaKenkoh. *Clinical & Investigative Medicine* 2006; 29(5): 293-7.
63. Southard DR & Southard BH. Preventing and treating childhood obesity with MetaKenkoh. *Circulation* 2004; 109: e187-e190.

PART 2: Scoping Study

Introduction

Pedometers are becoming an increasingly popular tool for use with children and young people as a means of increasing physical activity levels. However, very little is currently known about (a) the ways in which they are being used within Scotland and the rest of the UK and (b) the extent to which they are effective in helping to increase physical activity among school-aged children. Thus, the scoping study was undertaken to gather information about current pedometer use among this age group.

The overall aims of the scoping study were as follows:

- To gather information about current pedometer use among school-aged children across the UK
- To identify existing pedometer programmes which have already been evaluated and collect and review evidence from these
- To collate information relevant to good practice

It should be noted that the scoping study was not intended to provide a comprehensive mapping of pedometer projects across Scotland, or indeed, the UK. Due to resource constraints, projects were identified by following leads provided by initial contacts within national agencies. The examples presented in this report represent those responses returned to the research team within the given timescale. As such, these should not be considered to be representative of pedometer projects in general. There will no doubt be many more examples of pedometer use among school-aged children which it was not possible to capture within the current study.

Methods

It was assumed that pedometers would be being used in a wide variety of types and sizes of interventions. Time and resource limitations of the study (exacerbated by the timing of the Easter school holiday) restricted the possible breadth of contacts across the UK and made it unrealistic to aim to establish the total number of pedometer interventions taking place at any one time. In order to reach examples of the widest range in the short time available, a pragmatic decision was taken to sample at three different levels: UK-wide, Scotland-wide and Edinburgh-wide. Edinburgh was chosen for the most concentrated coverage of school-based interventions, as its proximity to the study base meant optimal opportunity to respond quickly to informal channels of information. Therefore, while the study does not provide a complete ‘snap-shot’ audit of all programmes across the UK, and cannot claim to have a statistically representative sample, it does offer an insight into the nature of a range of current and recent interventions at different levels.

At UK level, initial contact was made with named individuals from key national organisations. A list of all contacts is provided in Appendix 1. One example of a recent, independently evaluated project (*Schools on the Move*) was identified. An in-depth, face-to-face interview was undertaken with a member of the project team and

relevant documents were obtained including a copy of the evaluation report. Findings from this project are presented as a separate case study.

Within Scotland, a list of local-level projects and contacts was generated through the initial contacts in national agencies. Most of the national partners provided details of further contacts and some also volunteered to distribute an introductory email to their own networks asking for those involved in pedometer projects to respond directly to the research team. An e-questionnaire was then distributed to those who responded.

Contact was made with key individuals within the City of Edinburgh Council. Of these, three volunteered to distribute an introductory email to their own sub-networks, which meant a comprehensive distribution of information across Edinburgh schools. An e-questionnaire was distributed to those who responded. It was also possible to respond to word-of-mouth information about two local projects in both primary and secondary schools, which were visited. At short notice, teaching staff facilitated impromptu focus group and an individual pupil interview.

The survey questionnaire was developed specifically for the study to gather information about the types of projects, perceived advantages and disadvantages of pedometer use, project participants, issues related to organisation and implementation of projects, evaluation of impact and future plans. The instrument contained both closed and open questions to allow for optimum combination of quantitative and qualitative data. Where a respondent had already provided information about their pedometer interventions in their initial contact with the researcher, this information was entered into a questionnaire before sending it out to them so as to minimise the demands made on the respondents. In such cases, respondents therefore received partially completed questionnaires and were asked to fill in any missing sections. Some of these were not subsequently returned but the partial responses have been included in the data.

In addition to the Schools on the Move case study in England, two examples of relatively intensive, self-evaluated projects in Scotland were identified as case studies (one from a recent article in the Times Educational Supplement for Scotland and one from the distributed emails). In-depth interviews were undertaken with representatives from all three projects, two by telephone and one face-to-face. The survey questionnaire was used as the basis for the interview schedule for the three case studies. This meant that relevant data from the two Scottish projects (South Lanarkshire and the Western Isles) could also be included in the survey questionnaire results. The interview schedule for the English case study combined elements of the questionnaire with an exploration of issues arising from the project evaluation report. The case studies are presented in Part 3 of this report.

Survey Results

Respondents

A total of 37 questionnaires were returned by 30 respondents in Scotland. Some respondents completed more than one questionnaire as they were reporting on more than one pedometer project. In some cases, respondents coordinated a range of projects over a geographical area and others described one project in which they had been involved.

Roles of respondents were as follows:

- 15 Active Schools Coordinators^d
- 1 Active Schools Manager
- 5 School Travel Coordinators^e
- 2 Principal Teachers (Physical Education)
- 1 Transportation Officer
- 1 Head Teacher
- 2 Class Teachers (nursery / secondary)
- 1 Health Promotion Officer
- 1 Development Officer, The Waterways Trust
- 2 school staff (roles unspecified)

Respondents covered a wide geographical spread: seventeen of the thirty two Scottish local authorities were represented in the returns. In addition, one NHS board (Ayrshire and Arran) responded in addition to one voluntary agency (The Waterways Trust Scotland). The 17 local authorities represented in the survey were as follows:

- Argyll and Bute
- Dumfries and Galloway
- East Ayrshire
- East Dunbartonshire
- East Renfrewshire
- Edinburgh
- Highland
- Inverclyde
- Midlothian
- Moray
- Orkney
- Renfrew
- South Ayrshire
- South Lanarkshire
- Stirling
- West Lothian
- Western Isles

^d For more information on 'Active Schools' initiative, see:
<http://www.sportscotland.org.uk/ChannelNavigation/Our+activities/TopicNavigation/Active+Schools/>

^e For more information on the 'School Travel Coordinator' initiative, see:
<http://www.scotland.gov.uk/Publications/2005/09/28140238>

Over half of the respondents were Active Schools staff. This usually meant that they initiated and oversaw the development of projects, which were administered by one or more schools. A wide range of pupil numbers per project was represented, from around 15 in one secondary school to several hundred across a whole local authority.

A number of people responded to the survey to say that there were no pedometer interventions happening within their areas. However, the researcher was informed informally, by word of mouth, of two projects which she was not otherwise made aware of through the formal networks. In fact, in this case, the local School Travel Coordinator had previously emailed to say that there were no pedometer initiatives happening in that area. This shows that small-scale initiatives can develop at school level without area coordinators always being made aware of them.

While it was impossible, within the scope of this study, to explore networks within England and Wales in the same way as was undertaken in Scotland, the researcher did enter into dialogue with the Countryside Council for Wales, to investigate information that pedometers had been used in a large-scale project. It transpired that pedometers (which had been made specially to order for purposes of cost and ease of use) had been distributed among a range of small walking-related projects, on the assumption that they would increase enthusiasm for walking, although the usage of the distributed pedometers was not monitored. They tended to be given out as prizes and informal incentives to start or continue walking – initially in organised, led walks.

Pedometer use

Purpose of pedometer use

Unsurprisingly, the reasons for using pedometers were mostly related to physical activity programmes (Table 1). Half of the respondents also reported a health-related element to the intervention, although it was obvious, from further details provided, that there was considerable overlap between categorisations of physical activity and health. Specific purposes reported were mostly behavioural in nature, with pedometers used as a motivational tool to increase physical activity levels. Explicit examples included encouraging children: to be more active more often; to be more active specifically at break and lunch-times; to increase their levels of walking; to walk to school; to walk more outside school hours and; who do not normally take part in organised activities to be active. In addition, some were used to help develop School Travel Plans.

Table 1: Purpose of pedometer use

	n	%
Pedometers distributed but not followed up	1	2.7
Part of a physical activity programme	14	37.8
Part of a health programme	4	10.8
Part of a joint physical activity / health programme	15	40.5
Unspecified	3	8.1
Total	37	100

On three occasions, respondents reported an educational aim, with pedometers being used to help raise pupil awareness of the need for more physical exercise, and how easy it can be to become more active. Others were built in to areas of the curriculum such as science (eg nature trails), geography (eg plotting routes and distances walked to school) and local history (sites on virtual route). Two respondents indicated that their purpose was to evaluate the usefulness of pedometers as motivational tools and one reported use as part of an alternative-activity punishment for forgetting PE kit. One project was targeted at staff only, as a response to staff requests for help with increasing daily activity (under the auspices of the 'Health and Welfare of Staff, aspect of the Health Promoting Schools initiative). Projects were often explicitly tied into specific national and local policy initiatives, such as Active Schools, Health Promoting Schools, Eco Schools, Walk to School Week, Health Weeks and Healthy Highland Week.

Pedometer interventions were often described as being part of wider health and/or physical activity initiatives. One example of this was entitled the 'Passport to a healthier you' programme which aimed to address a range of issues including physical activity, self-esteem, appearance, eating habits and teamwork. Another example was part of an improving fitness experiment, which involved setting PE groups within one school year (see Case Study 1).

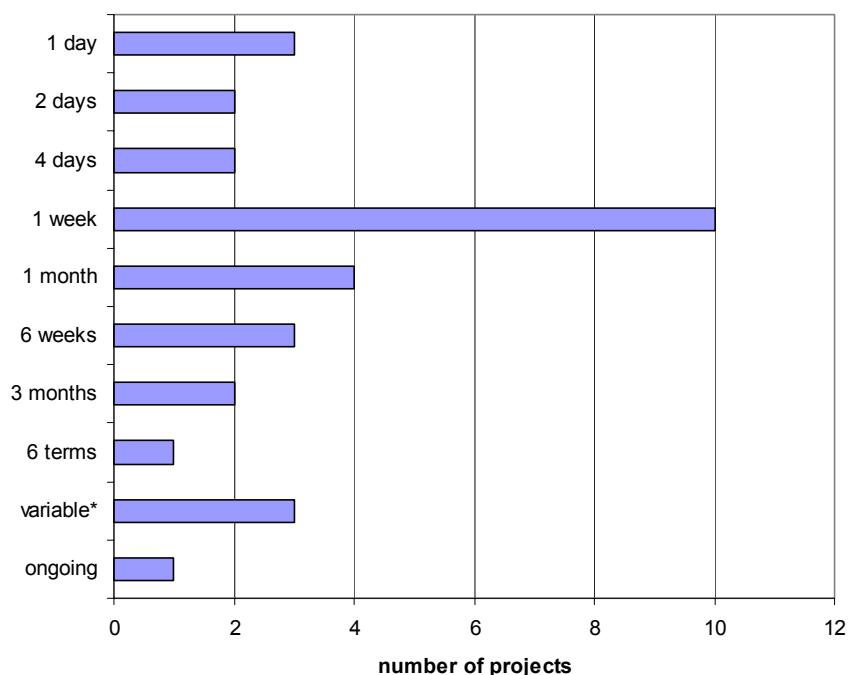
Types of projects

A wide range of types of interventions were described among the 37 responses. Most involved pupils wearing pedometers for specific time-lengths or events and recording the number of steps taken. Some coordinators distributed pedometers with sample lesson plans, leaving it up to individual schools how they were used. Others described fun-orientated inter-school or inter-class challenges. Some creative projects involved translating step counts into distances and travelling imaginary or 'virtual' routes. Examples of this included plotting individual routes on a local map, as well as more ambitious individual and collective schemes: a 'Virtual walk to Malawi'; 'Walk Scotland End to End'; 'Charlie Boorman and Ewan McGregor's Bike Around the World Challenge' the 'Western Isles Walking Route' and walking circumferences of the moon (tied in with a visit to the school by an astronaut).

Length of pedometer interventions

Thirty-one respondents provided information about the length of time pedometers were used for (Figure 1). The length of time varied from one day to six terms. In one cases, the project was ongoing. Over half of the projects were specifically of a week or less in duration. The longest case, six terms, was an example of pedometer usage being one element of a larger, multi-aim project.

Figure 1: length of pedometer projects



**these responses were from area co-ordinator, who indicated that length of project was left to individual schools to decide.*

Location of interventions

All of the pedometer initiatives described by respondents involved schools. Of the 37 responses, 34 projects (92%) were solely school-based and three (8%) were jointly based in a school and community setting. None of the initiatives were solely community-based. Table 2 shows the type of school in which the pedometer initiatives took place. The majority (65%) were undertaken in primary schools and two involved schools for those with Additional Support Needs (ASN).

Table 2: Type of school

	n	%
Primary only	24	64.9
Secondary only	7	18.9
ASN school only	0	0
Primary & Secondary	2	5.4
Primary & ASN	1	2.7
Secondary & ASN	1	2.7
Not specified	2	5.4
Total	37	100

Types of pedometers used

Seventeen respondents provided details of the types of pedometers used. Therefore there a wide range of types and prices of pedometers are represented, with a variety of functions. Several respondents said that they had had problems with unreliable pedometers or breakages, particularly in relation to cheaper models. Details of the responses are shown below:

- Silva (4)
- Unspecified make, provided by Moray Council. Basic functions of steps and distance
- Very basic, step counts only, unspecified make (3)
- Kelloggs ‘freebies’ (2)
- Step count, distance and calorie counter, unspecified make
- Health Promoting Schools pedometers
- Argos mid-price range (approx £3.99 each)
- Omron HJ-005-E
- Accusplit Eagle 140s Activity Pedometers (Davies Sport)
- Field and Trek Stormlite pedometers (good discount)
- Double powered DP85 pedometers
- Boots Calorie Counter (£10 reduced to £4.50 for bulk purchase)

What was measured by the pedometers?

In addition to measurement of steps, eighteen of the projects translated the steps into distance. Two projects reported that they calculated individual step-lengths of each pupil; the others either overtly stated, or implied, that step-lengths were estimated on an average basis. One specified that this average step-length was assumed to be 0.0004 miles. One indicated that they also collected information on the number of calories burned.

It is worth noting here that there were variations in the recommended pupil step-count daily totals. Most projects used the figure of 10,000 steps per day. However, one Scottish project used 12,000 and the Schools on the Move project (Case Study 3) used figures of 12,000 for girls and 15,000 for boys. The Youth Sport Trust Development Officer conjectured that the confusion may arise from the fact that the British Heart Foundation recommends 10,000 steps for adults, although they are also the organisation on which the Schools on the Move project based their separate girls/boys targets.

Mechanisms for monitoring step counts

Twenty-five (68%) of the projects had mechanisms in place for monitoring step counts. Teachers played the biggest role in recording, or assisting pupils to record, both individual and class totals at specific times, depending on the project (for example, at the end of break-times, end of the day or end of the week). Individual pupil records were common, in the form of cards, worksheets, diaries, ‘passports’ or booklets. Six respondents reported the use of classroom wall-charts and a number of others indicated the collection of class totals, but without specifying how this was

recorded. In one example, older pupils were given the task of assisting younger pupils with the recording and collection of step counts.

Mechanisms for providing personalised feedback

Overall, 22 respondents (60%) reported that personalised, individual feedback was given to pupils. Again this was done in a variety of ways – mostly by discussion or verbal comments when step counts were recorded. Also mentioned were: the personal records as described above; certificates recording individual counts and individual distances plotted on imaginary routes.

Additional support provided with the pedometers

Over half of respondents indicated that additional support was provided when the pedometers were given out. Examples included: presentations/discussions on the health/fitness benefits of their use; practical demonstrations on usage and written information in the form of leaflets, booklets and/or worksheets. While only two indicated that no support was given, 40% (14) gave no response to this question. Given comments in other sections (and in the in-depth interviews) about the importance of support, it is possible that there was ambiguity within the question which limited responses.

Use of existing resource packs or support materials

Only seven respondents reported use of existing resource packs but, in fact, six of these were examples of packs which had been developed ‘in-house’. On five occasions where there was a ‘no’ response to this question, respondents had also indicated that they had developed their own resource packs. There was only one case where an externally-created resource pack had been used: Sandwell Council’s ‘Walk the World’ resources.

Opportunities to promote walking and/or other physical activities as part of the pedometer intervention

Nineteen (51%) respondents said that they provided specific opportunities to promote walking and/or physical activity as part of their pedometers projects. Opportunities included: playground routes with obstacles to walk round; additional PE sessions; additional specific activities such as orienteering, handball and rounders; active encouragement for walking to school; guided walks outside and inside school grounds; a sponsored walk; nature trails; playground games; various walking races; free visits to gym; and choice of more varied activity in PE. These opportunities were variously led by Class Teachers, Active Schools Coordinators, School Travel Coordinators, The Waterways Trust staff and parent volunteers.

Incentives to encourage participation

Respondents were asked if they had used any incentives to encourage participation in the pedometer projects. Again, the diversity of projects was reflected in the variety of responses to this question. All respondents who fully completed questionnaires reported incentives of some kind. In general, the fun/interest elements of the projects

were seen as incentives in themselves. Examples included: a discussion with an astronaut; a project on the world's tallest man to compare step-lengths; plotting distances on maps relating to the imaginary walks (e.g. using different colours for different sections; getting maps to take home); fun activities at a launch event; and following collective and individual progress on wall-charts or tables.

More specific incentives were provided at three levels: school, class and individual. Individual awards were most common, with nearly all projects reporting some kind of incentive.

Examples of incentives at individual level:

- Certificates and stickers (including two examples of graded certificates [bronze, silver and gold])
- Personal challenge sense of achievement
- Unspecified prizes for furthest individual distances
- Unspecified prizes for highest individual number of steps
- Medals
- Fluorescent and reflective novelty items
- Eligibility for prize draw.

Examples of incentives at class level:

- A trip out, plus umbrellas and pedometer prizes for each member of winning class
- Unspecified prizes for longest distances travelled
- Unspecified prizes for highest step counts
- 5 minutes extra playtime
- A swim at a local pool.

Examples of incentives at school level:

- Competition between eight schools for the 'Golden Boot Award' (including a pedometer for each child in winning team)
- Collective incentive for seven schools to achieve 'imaginary walk' targets
- Certificate and prize for school covering most distance
- An afternoon at local sports centre.

Two additional types of award were also mentioned although it was not clear at which level these awards were made: the John Muir Award and the TWTS certificate from The Waterways Trust.

Participants

All of the projects in Scotland involved both sexes. None were targeted specifically at either boys or girls. Respondents were asked if any of the projects had been targeted specifically at other groups. Out of twenty four responses to this question, the vast majority indicated that all children within the relevant age range or classes took part. However, three projects described at least some element of specific targeting. One of these reported that a quarter of their sixty participants were recruited from dieticians at a local hospital because they were classed as obese or inactive. Two others indicated that the project was specifically targeted at those who did not normally take part in organised sport.

While including all pupils in a specific year group, one school divided the population of the participating year group into three types of group, depending on assessed levels of fitness; different curricula were then devised for each group, in order to provide the most appropriate incentives for participation. One Active School Coordinator had wished to target inactive children, but found reluctance from participating schools because of possible connotations of discrimination. Despite involving the pupil council from one of the local schools in exploring ways of avoiding discrimination, no solution was reached and all children were included. However, it was noted that many of the children who took part would have fitted the categories of ‘fairly inactive, or certainly in need of increasing their activity level’ anyway. Similarly, another large project, involving 1,500 children, wanted it to be targeted ‘across the board’, but were particularly pleased at anecdotal evidence of impact on pupils who did not normally get involved in organised sport.

Organisation and implementation

Responsibility for organisation

A wide range of organisations were represented in the management and delivery of the pedometer initiatives (see Table 3). In addition to the schools themselves, the majority of projects involved Active School Coordinators (at school or regional level), either as sole organiser or in partnership with others. Other partners specifically mentioned included: School Travel Coordinators, Integrated Community Schools Health Coordinators, Road Safety Officer, school nurse, parents, community education and representatives from community facilities. One project was a local NHS initiative run in collaboration with the relevant local authority. Another was a joint project, run by the Waterways Trust and Paths to Health. Within schools, a number of different staff were involved such as School Management, PE staff, class teachers and Health Coordinators. In some cases, the project was run as part of, or linked to, existing programmes such as Health Promoting Schools, Eco Schools and SHAW.

Table 3: Who was involved in organising and running the project?

	<i>number of projects</i>
Schools	21
Active Schools Team	20
School Travel Coordinator	6
National agencies	1
School nurse	1
Health Board	1
Local Authority	1
Integrated Community School Coordinator	1
Road Safety Officer	1
Parents	1
Community Education	1
Representatives of community facilities	1

Problems, challenges and barriers associated with pedometer use

Although some respondents reported no problems, the majority highlighted a number of issues and challenges associated with the use of pedometers in schools. Some problems were encountered with the pedometers themselves. For example, some did not record all steps and were considered unreliable while other broke completely. In some cases, the clip broke or was too tight which led to problems for the children in putting them on. In general, problems with the pedometers themselves were particularly evident with cheaper models.

“Not enough of them were working properly” (*School Travel Coordinator*)

“General efficiency of the pedometers was limited” (*Active Schools Coordinator*)

In several cases, pedometers were lost by pupils and/or teachers. A couple of respondents said that around a third of pedometers had been lost. For this reason, in some instances, pupils were not allowed to take them home and they were only used within the school setting. Professionals working with schools reported that pedometers were not always returned and one attempt to establish a pedometer loan scheme to schools had been abandoned for this reason.

Several respondents reported that it was easy to knock the reset button and reset accidentally. This was seen as demotivating for pupils:

“Children are very eager to check their score and so would keep on re-setting the pedometer by pressing the button accidentally.” (*Active Schools Coordinator*)

Several respondents mentioned that the children soon realised that if they shook the pedometers the step count would increase! Therefore reports of step counts were not always deemed reliable. As described in Case Study 1, one PE department addressed this problem by confronting the issue directly with the children and stressing the importance of attaining personal goals rather than being in competition with others. To this end, a degree of trust was required in the pupils to look after the pedometers and record accurate information.

Others commented that wearing a pedometer became a distraction for the children in class. They were so keen to increase their step counts that they tried to take every opportunity to increase their activity levels:

“The main problem was that the teachers found it distracting. The pupils had to wear the pedometers all day long so they were always looking for an excuse to jump out of their chairs and add a few extra steps on. To quote one teacher, “they keep on jumping up and down!” (*Active Schools Coordinator*)

The amount of work involved in coordinating the pedometer projects and collating the data which was generated was a major challenge, particularly those for teachers. This came as a surprise to some. Respondents commented on the amount of time and energy required to sustain the projects over any length of time and that, within schools, curricular pressures could act as a barrier to developing the project to its full potential. In some cases, a lack of interest from teachers was identified as a problem, even when additional support was provided.

“More work than initially expected. A lot of input needed from teachers to remind pupils to put pedometers on at start of day and to collate stats at the end of the day (several children still forgot to do either).” (*Primary School Teacher*)

Evaluation

Evaluation of pedometer projects

Of the 37 projects represented in the study, just over a third (38%) included an evaluation. Six had yet to be evaluated as they were still ongoing. Evaluation took a number of forms. In many cases, projects were evaluated internally by Active School Coordinators or school staff. Typically this took the form of pupil surveys, for example, hands-up surveys in the classroom of pupils’ activity levels or travel to school. In some cases, school staff were given an opportunity to feedback their comments and, in one project, class discussions were held with pupils four months after the project to illicit their views and assess impact. In one project involving the School Travel Coordinator, the evaluation took the form of a School Travel Survey and results were used to feed into the development of the School Travel Plan.

Two of the projects were evaluated externally. One project involved a brief evaluation undertaken by a community worker who had been involved in the project which focused specifically on what the children had enjoyed so that their views could be taken into account in the development of a summer programme. Another project was evaluated by staff from The Waterways Trust, resulting in the production of an evaluation report and DVD. Two projects in England were identified which had been subject to independent evaluation by researchers in University departments. These are described separately in Case Studies 3 and 4.

Impact of pedometer use

Those involved in organising the projects generally reported good uptake by pupils and described a range of impacts the individuals involved such as raising awareness of the importance of walking, increased motivation to be active and changes in behaviour. In addition, the projects had provided opportunities to develop links within a range of curricular topics. These reported outcomes are described below. Perhaps most importantly, many of the respondents reported that the pedometer-based activities had been well-received and were seen as enjoyable by the pupils themselves.

- *Awareness-raising*

Using the pedometers was seen as an opportunity to let children know how much physical activity they should be doing and to increase knowledge about the importance of walking in relation to children’s health. Pedometer projects were perceived to have raised the profile of walking not just among children, but also among parents and teachers. One respondent said that feedback from pupils following the project demonstrated that they understood the 10,000 steps a day message and recognised the benefits of walking rather than driving to school.

“Kids loved wearing the pedometers; it really gave them a tangible piece of evidence as to the sort of distances they could cover. Parents and teachers were amazed at how much the children could achieve ‘just by walking!’” (*School Travel Coordinator*)

“Children that may not like taking part in sport etc have now seen that they do not need to take part in football etc to be physically active.” (*Active Schools Manager*)

“I don’t think children realise how much physical activity they should be taking part in on a day to day basis. By measuring their steps and having an idea of how many they should be taking it gives them a clear indication of where they are and where they need to be.” (*Active Schools Coordinator*)

- *Motivation*

In general, the pedometers were seen as a good motivational tool for children. The ability to see and record step counts was perceived to work well as a positive reinforcement technique which encouraged children to be more active in order to increase their step count. They also provided an incentive to engage with school activities such as Walk to School Weeks. Enjoyment was an important element of motivation.

“Really motivated the children to take part in the Walk to School Week.” (*School Travel Coordinator*)

“They help to motivate the children. We get them to note down their steps each time they go out and some children find that the more they go out the more steps they are getting – this makes them feel proud.” (*Active Schools Coordinator*)

“The pedometer acted as motivation for some of the children. They were keen to check how many steps they had achieved, and compare with their fellow classmates.” (*Active Schools Coordinator*)

“Pupils enjoyed wearing the pedometers and were motivated to improve scores as a result.” (*Secondary PE Teacher*)

The issue of sustainability was highlighted in relation to motivation. Some respondents commented that initial increases in motivation and activity levels were not always sustained over time. For example, one class teacher described how some children lost the motivation to continue when they realised that others were cheating by shaking their pedometers to increase their step counts.

- *Impact on behaviour*

Most of the respondents felt that pedometer use had had an effect on pupils’ behaviour, even to the extent of pupils marching on the spot while standing in queues in order to increase their step count! One evaluation, undertaken by the Active School Coordinator and School Health Coordinator, found that 92% of pupils said they had started walking more since the beginning of the project. In addition, 89% said that walking made them feel fitter and healthier. There was also some anecdotal evidence that the pedometers had had an effect on other family members, for example, through children taking their parents out on walks both during and after the project.

“One P6 class demonstrated an average of 60% more steps per pupil than the recommended daily number of 10,000 steps.” (*School Travel Coordinator*)

“They motivated the children to do more activity throughout the day. Children who do not usually take part in activity were walking and running about.” (*Active Schools Coordinator*)

“The school has seen an increase in the number of children walking to school as the parents were also targeted as they were the ones driving. Now many parents drive to the local library and park the car there and walk the rest of the way with the children.” (*Active Schools Coordinator*)

“Total distance travelled in project amounted to 2.5 times round the world!” (*Active Schools Coordinator*)

- *Curricular links*

In some cases, the data gathered from pedometers had been used within specific classes such as Maths. The pedometers had also been successfully used to engage children in broader school initiatives such as Walk to School Week.

“The information that schools / pupils gained from the use of the pedometers has been used in other areas of the schools, for example, maths, with the number of steps etc being converted into graphs....” (*Active Schools Manager*)

“They can be used not only to encourage exercise but the results gathered can be used to improve numeracy through the processing of information.” (*Secondary School Teacher*)

“Really motivated the pupils to take part in the Walk to School week. This was the first year we have tried the Health Promoting Block and had such an active involvement in Walk to School. We hope to build on it next session.” (*School Travel Coordinator*)

However, the curriculum could also act as a constraint due to the limitations on time available for development and continuation of the projects. This raises the issue of resource pressures on schools and highlights the need to integrate initiatives such as the pedometer projects into the curriculum in order to link directly to educational goals and promote sustainability.

General reflections and future plans

Perceived advantages of using pedometers as a means of promoting physical activity

Based on their experience, a wide range of advantages of pedometers were identified by respondents. These included the following:

- Good incentive / motivation tool
- Fun
- Provide a challenge and allow goal-setting, which can be geared to different levels
- Easy to use
- Inclusive (i.e. not threatening for low active children)
- Appealing to children (they like gadgets!)
- Encourage competition between friends / classes
- Can promote a sense of personal achievement
- Private – individuals can track own progress without sharing results
- Reinforce walking as important activity

- Data can be used in class to link in with a range of curricular topics

“All children can see the benefits, not just the “active ones” (*School Travel Coordinator*)

“They are an excellent means of encouraging children and adults to increase their levels of activity. They give a definite number of steps or distance which can be improved on.” (*School Travel Coordinator*)

“Children like to use technology – if it can be incorporated into an activity they are far more interested in it.” (*Active Schools Coordinator*)

“Provides a tool which enables pupils who are not usually engaged in sport to reach targets: something they can do on their own, at their own speed, without feeling incompetent.” (*Active Schools Coordinator*)

“It was a great fun way to encourage walking and activity. It was something we could do with the whole school, across the age range and regardless of ability or fitness level, because each child had a personal target. We also tried to do the daily activity despite the weather.” (*Primary Head Teacher*)

Several of the respondents highlighted the importance of using pedometers as a *tool* for helping to promote physical activity and not as an end in themselves. Of the 37 responses, 25 (68%) said that they would encourage the use of pedometers again. None of the respondents said they would definitely not encourage future use of pedometers, but 12 did not give a response.

Those who said they would use pedometers again were asked what they would do the *same*. While some respondents said they would do everything again, others highlighted particular examples of elements of the project which had presumably worked particularly well. These included the following:

- Re-run competition
- Use record sheets
- Encourage a daily activity in school
- Encourage staff to use them
- Allow children and staff to take them home
- Ask children for regular feedback
- Have personalised target for each child
- Link with Walk to School Week
- Work with one class at a time
- Use class wall chart to track progress
- Link to curriculum (Maths)
- Use to promote sustainable travel
- Low key approach to encourage enjoyment of walking

“Six week challenge was a good amount of time to run the project which looked at breakfast, lunch, physical activity etc. It was a great success and all the schools really enjoyed the challenge along with the children. As with anything it would need tweaked but overall was great.” (*Active Schools Manager*)

“The pupils found it very amusing to judge the teachers. It means that they are now willing to have a go and see if they can beat us. The competition got the message across and also broke down a few stereotypes...” (*Active Schools Coordinator*)

Respondents were also asked if there was anything they would do *differently* another time. Several commented that they would purchase better quality pedometers to minimise breakages and maximise reliability. Other respondents highlighted specific ways in which they would further develop the projects in future in order to promote effectiveness. These included: greater focus on parents; encouraging pupils and staff to set goals; providing more organised activities to encourage use e.g. walks and games; establishing baseline steps to enable monitoring of change over time; linking more to the PSE timetable to increase knowledge levels; developing links with existing networks and external partners e.g. ‘Walking for Wellbeing’, Road Safety Officer, Sports Development Officer; extending the length of the project; and ensuring enough pedometers for all schools / pupils to take part.

One Active Schools Coordinator said they were not sure that the pedometers worked so well with secondary pupils. Primary pupils were perceived to have engaged much more with the project. Another secondary school respondent felt that pedometers were most effective when used with smaller groups of pupils to allow for more individualised support and feedback.

Some respondents commented on the need for individual enthusiasm to facilitate sustained interest throughout the duration of the project. Teachers were seen to play a critical role in this, although external professionals such as Active Schools Coordinators may also be able to provide this role if they have ongoing interaction with the children.

“For kids to engage, it is crucial that somebody somewhere is enthusiastic about it – is positive and supportive – and if that isn’t coming straight away, its very easy for something to go on the back burner.” (*Active Schools Coordinator*)

Advice to other schools

Finally, respondents were asked what advice they would give to other schools or groups with regard to pedometer use. Below is a list of the main recommendations provided:

- Make sure all pedometers are working properly before giving them to the children
- Have plans in place to encourage use after project has ended
- Invest in good quality pedometers
- Get more pedometers than you need (to cover for lost or broken ones)
- Make it fun
- Use the internet to access resources, games and class lessons
- Get your pedometers well in advance to allow time for sourcing and purchasing
- Ensure schools / teachers are on board from early on
- Staff need to be motivated as it can involve a lot of work
- Use pedometers within context of active and healthy lifestyles

School visits

Two schools in Edinburgh, one primary and one secondary, were visited during the course of the study. Both had been reported to the researcher, by word of mouth, as using pedometers for particular school-level initiatives.

In the case of the **primary school**, an interview was arranged with the Deputy Head Teacher but this had to be unavoidably cancelled at the last minute. Instead, an impromptu class visit was organised, during which a discussion took place between the researcher and a group of around twenty P4 pupils (aged 8 years) who had recently taken part in an Eco Schools walking initiative. While this could not be seen as a formal part of the research – particularly as these specific pupils had not taken part in the pedometer-based project, which had been a couple of years before - we felt that some of the key points raised by the pupils about walking are worth including here.

Most of the pupils contributed to the discussion, all of whom said that they enjoyed walking and thought that it was a better alternative to travelling to school by car. Some take part in the ‘walking bus’ to school. Reasons given were as follows: more fun because it was chance to talk to friends; enjoyment of fresh air (several said they didn’t like the smell in cars); enjoyment of the view (the ‘walking bus’ route is scenic); better for the environment and healthier. The only problems raised were related to arguments with friends on the ‘walking bus’ route. Some knew about pedometers and there was general interest, including that of the teacher, in using them for future walking projects.

A **secondary school** geography group was also visited, at the invitation of the teacher concerned, during one teaching period. The 13 S5/S6 pupils (4 girls and 9 boys, aged 16-17 years) were part of an Eco Schools/Healthy Schools class project. It was hoped that the successful completion and presentation of the project would contribute to a third Eco Schools ‘Green Flag’ award for the school^f.

Pupils were investigating the benefits of walking to school, instead of travelling by bus or car. Each had been given a pedometer to measure step-counts, distance and calories burned during their respective home-school walks. Some were also informally using the pedometer to measure distances walked in other circumstances. At the time of the visit, the project was in its early stages and negotiations were still taking place about how results would be calculated and presented.

The class period was divided into a whole-group discussion, followed by individual study, during which a male pupil volunteered to be briefly interviewed by the researcher. The group session involved integration of the pedometer-based project into the geography curriculum: pupils were asked to plot their home-school distances on a large-scale map within the context of the technical concept of ‘sphere of influence’. Practical issues about pedometer use were also covered, including the implications of one pupil ‘cheating’ by shaking the device.

^f For further information on the award system, see: <http://www.ecoschoolsscotland.org/>

In addition to general information about the project, the pupil interviewee indicated that he was finding the use of the pedometer an interesting personal challenge. As well as recording home-school journey details, he was also using it to investigate other scenarios out of personal interest. For example, he decided to measure how many steps he took from getting up in the morning before leaving the house for school, as he was convinced that he covered a lot of distance within the home. He had been gratified to find that this amounted to half a mile which was comparable to the distance he measured in walking to his grandfather's house. He was also experimenting with measurements of distance travelled in a whole day (including a lot of travelling up and down stairs at school) and calories burned in a day. He expressed intention of measuring intake of calories in a day in order to compare the two totals.

He felt that the pedometers were easy to use - 'I hardly noticed it' - and that the only problem was remembering to put them on because they are so small. In his view pedometers make a difference because they 'challenge everybody' and 'make people walk more', with the qualification that this would only apply in good weather.

Conclusions

The pedometer projects represented a wide variety of types, locations, lengths, intensities and levels of sophistication. The majority of projects were short-term, with a week being the most common length. Most took place within schools but a few also included a community element such as organised walks led by teachers / partner agencies or activity sessions in local leisure centres. Projects were managed and delivered by a range of organisations. Active Schools staff were involved in managing just over half of the projects in Scotland.

All projects came within a physical activity remit, at least half of which also included a specific health focus, with considerable overlap between. Some also had environmental and road safety elements. Aims were mostly behavioural (to increase physical activity) but many also included an educational purpose (to raise awareness of and/or to change attitudes towards exercise). There was a lack of consistency in the figures used as recommended daily step-count totals which should be addressed in future projects.

Only a minority of projects were actually targeted towards less active pupils. However, even where projects were offered to all activity levels of pupils within a school, there was recognition that pedometer interventions can be particularly beneficial for less active pupils. The Schools on the Move evaluation offered some statistical evidence of this and other projects provide more anecdotal reports. The fact that pedometer challenges can be individual and private in nature, with personalised goal setting was felt to be important in engaging this group. Several projects also included teachers in wearing pedometers and feedback showed that pupils value the involvement of teachers as participants and find it motivating.

In general, pedometers are valued as enjoyable, motivational tools which can be effective in increasing both activity levels and awareness of the need for activity among pupils, particularly within short-term projects. They can provide an incentive to engage with other activities, including those embedded in cross-curricular themes. Pedometers seem to be most effective as short-term catalysts and should not be seen

as an end in themselves. However, a number of frustrating and de-motivating practical problems can arise, including the unreliability and fragility of some cheaper models and the fact that they are small and easily lost. There appears to be a need for projects to have good advice on which types of pedometers would suit particular purposes and a forum within which to learn from each other's experience. A 'good practice' forum would also enable staff to share ideas and experience about what lengths, types and timings of pedometer interventions are realistic and how positive impact on behaviour and awareness can be sustained over time and integrated effectively into the curriculum.

While communication networks within relevant key agencies are extensive, there is a need to develop ways of sharing information across different partners. It is still possible for small-scale projects to exist without the knowledge of/support from these formal national and regional networks. For example, School Travel Coordinators were not always aware of relevant work being undertaken by Active Schools Coordinators which may, in part, be a reflection of differences in the size of geographical area covered by these posts.

Feedback from coordinators and school staff revealed that pedometer interventions are time-consuming for teaching staff and, as such, require teachers to understand, and be committed to, their potential value. A corollary of this is the evidence of the positive difference it makes when teachers 'buy in' enthusiastically, both in terms of efficient administration of schemes and of creative ideas for enhancement and cross-curricular developments. The level of work involved means that it is particularly difficult for staff on smaller-scale initiatives to collect and analyse data which would track the impact of pedometer use during the course of projects. Thus, the step count data collected was not always used to its full potential. Quality support for teachers was perceived to make a positive difference to their participation. There was a strong message that ongoing support is important in addition to initial advice, information and resources.

It is suggested that any guidance on pedometer use which is prepared for schools should address the following issues which were raised by the survey respondents:

- Which type of pedometer to use
- Recommended timescale for projects
- How to involve and support teachers
- How to sustain engagement among staff and pupils
- Recommended daily step count targets
- Analysis and use of step count data
- Opportunities for linking in with the curriculum

PART 3: Case Studies

Introduction

The three case study examples described below were chosen opportunistically based on either previous awareness of the projects or information provided by initial contacts in the scoping study. Case studies 1 and 2 provide examples of pedometer projects undertaken in Scotland. Case study 1 is an example of a project led by the Physical Education department of an urban secondary school. Case study 2 is an example where development workers initiated and provided support for a project among primary schools across a rural local authority. The information presented was gathered from internal reports produced by the projects and from telephone interviews with the project coordinators. Neither project was subject to formal, independent evaluation and therefore the findings should be considered within this context.

Case Study 3 provides an overview of the *Schools on the Move* pilot programme developed by the Youth Sport Trust. This is a much larger project, implemented in 54 schools across England. The pilot was evaluation by a team of researchers at Middlesex University. Information about the project is taken from the evaluation report and an interview with the Youth Sport Trust Development Officer.

Case Study 1: PE Department, Stonelaw High School, Rutherglen

Background context

Stonelaw High School is a large, urban, secondary school in South Lanarkshire with a school roll of 1300 pupils. The PE department has a history of undertaking small-scale research to directly inform practice.

On the basis of completing the same 20 Meter Shuttle Run Tests with over 400 S1 and S2 pupils (age range 11 – 13 years) in 1989 and again in 2004, the department found that the general fitness levels of most pupils had significantly reduced over the fifteen year period. The only group of pupils whose fitness levels had stayed the same were those who had demonstrated the highest scores. This provided the impetus for the department to explore new ways of raising the fitness levels of the least active pupils.

It was decided that the 240 second year pupils would be divided into three fitness sets, according to a combination of performance in specific assessments and ongoing observation. It was hoped that by ‘setting’ in this way, appropriately challenging and enjoyable activity targets could be set for each group, while developing the confidence and self-esteem of those who would otherwise tend to disengage from physical activity.

The lowest-level group (known as the ‘Fitness’ group), comprising sixty pupils, was provided with a different curriculum from the other pupils in the year group. The ‘Fitness’ curriculum contained a core level of aerobic activity, within a more varied range of activities generally; this range included wider health-related, cross-curricular elements, as well as fun activities. Examples included: running/power walking around

a local heritage park rather than around the school; 'health MOTs'; use of the school Fitness Suite (normally only available to older pupils); Home Economics diet sheets and fun games. Feedback from the pupils was that the variety was appreciated and enjoyed. The principal teacher (PT) reported that, because they were enjoying the activity so much, '*...they were working without realising the effort they were putting in...It was all about the individual and his/her performance/improvement.*' As further motivation for pupils to increase activity, and as a measure of comparative activity levels, it was decided to include a month-long pedometer project as part of the new programme.

The pedometer project

In February 2006, the PT raised £1,300 from two South Lanarkshire Council sources: the 'Enterprise Initiative' and the 'Integrated Children's Services' fund. The money was used to purchase 300 pedometers with step, distance and calorie counting facilities. All sixty 'Fitness Group' pupils were loaned a pedometer, along with sixty pupils from each of the other two fitness sets, plus forty volunteer parents and fifty volunteer school staff. The central objective was to calculate the average number of steps the pupils took each day. Results from parents and staff would be an 'added bonus'.

Each participant was asked to wear the pedometer all day for as many days as possible throughout the month, and record each day's step count on an individual record card. The record card distinguished between weekdays and weekends. Participants then calculated their average weekday and weekend totals, with help from senior pupils and staff where necessary. In addition, pupils in the Fitness Group were asked to use a separate pedometer to calculate how many steps were taken during PE lessons alone, and a separate record sheet was provided for this.

Original ambitions to calculate distance and calories in addition to step counts were scaled down to collection of step-counts only. Calorie counts were ruled out from the beginning due to recognition of the complexities involved. Despite individual stride lengths being measured initially, so that distances could more accurately be calculated, a pragmatic decision was taken not to include distance information either:

"We decided that we would base our results mainly on the steps taken because this was easier for pupils to understand. The distances varied according to the stride length of the individual, e.g. a pupil with a long stride length could cover more miles than another pupil, but actually walk less steps in doing so. At this point it gets very complicated. We then asked ourselves, regardless of stride length, would we all become more fit if we each walked more steps each day – the answer was 'yes'. On this basis we decided to concentrate on 'steps' only." (Principal teacher, PE)

Practical challenges

The main challenge to providing detailed results from the project was the unforeseen amount of work involved in raising funds, setting up and maintaining such a project with so many participants. The reality of recording and collating the results, sorting out lost and forgotten pedometers and collecting them in, et cetera, proved to be

extremely time and energy consuming - described by the PT as ‘*a month of non-stop work.*’ This meant that more ambitious possibilities (such as tracking individual progress over the month) could not be realistically pursued.

Another problem was the ease with which pupils could create false results by shaking the pedometers. Staff dealt with this by confronting the issue directly with pupils, stressing the personal rather than competitive nature of the project challenge, which the PT felt was quite successful, although, ‘*we had to accept that some would still shake them and that therefore the results weren’t going to be scientifically valid.*’ The fact that pedometers are easy to lose was also problematic, with around 10%-15% being lost during the course of the month.

Despite these challenges, staff felt that the outcomes, while more limited than they would have wished, were worthwhile in themselves and provided learning for future projects.

Project outcomes

During the project, staff reported that many pupils informally indicated that they enjoyed wearing the pedometers and that they felt motivated to improve their step-counts as a result. Since the project finished, the ‘Fitness group’ pupils have been observed to maintain greater enjoyment of exercise and more vigorous activity levels in PE classes than before. It is felt by staff that the pedometer project helped to encourage this, although it is not possible to be certain about the independent effect that the pedometer intervention had on this latter change, over and above the effect of the major curriculum restructuring. While taking this into account, informal observations of the role of pedometers in providing motivation for individual behaviour change made staff feel that the exercise was beneficial.

The participation by staff and parents was felt by the PT to have had a positive effect on pupils, ‘*both in terms of participation levels and in creating “a buzz” around the school and at home*’.

The challenges, as described above, mitigated against the second aim, to produce accurate data to track comparative progress – particularly in terms of tracking progress during the course of the month. However, staff felt that the actual numbers who did return step count data over such a relatively long period of time were sufficient to provide useful information at a collective, summative level.

Comparisons between the average weekday and weekend step-counts among all participating groups were calculated. The results, as published in the project’s internal review were as follows:

	Weekday average steps	Weekend average steps
‘Talented’ Section	11,500	9,000
‘Middle’ Section	10,000	7,800
‘Fitness’ Section	7,000	6,900
Parents	10,400	-
School staff	10,900	-

Results generally confirmed expectations, in terms of differences between the three fitness sets. Although the gap between ‘talented’ and ‘middle’ was rather less than expected, it was conjectured that this was related to the fact that the project took place in a winter month, when there were less opportunities for the kind of after-school activity enjoyed by ‘sportier’ pupils.

Staff found it useful to know that their suspicions about the comparatively low levels of activity of the least fit pupils were confirmed. Evidence that these low activity levels compounded the fitness problems of this group, and that there was little difference between their weekend and weekday activity levels, has provided incentive for staff to maintain their drive to break this perceived vicious circle.

Future plans

The restructured curriculum is set to continue for the foreseeable future. In this context, the PT for the PE department originally planned that the pedometer project would provide the baseline data for an annual measurement of progress. While the positive outcomes have given impetus to this general intention, the length of the cycle has been adjusted to take account of the amount of work for all concerned. It was felt that a five year cycle, tracking collective rather than individual progress, would be more realistic, in order to maintain the necessarily high energy and motivation levels of staff. Therefore it is planned that the statistical results from 2006 will be used as baseline data for a further pedometer exercise in 2011. It is intended that resources will in future be found to enable collection of distance as well as step measures.

Case Study 2: The Active Schools nan Eilean Siar Walking Challenge

Background context

A nationwide network of Scottish Executive-funded ‘Active Schools’ Managers and Coordinators was initiated in 2004, to positively impact on schoolchildren’s health through the promotion of physical activity. Managed by Sportscotland, the main aim of the initiative is:

‘to give school-aged children the tools, motivation and opportunities to be more active throughout their school years and into adulthood’^g

Each local authority in Scotland has its own Active Schools team. Among a small number of island-based, rural authorities is Eilean Siar, also known as the Western Isles. This region is comprised of a series of islands, which stretch for 130 miles off the north-west coast of Scotland. The Active Schools nan Eilean Siar project has four full-time and five part-time staff members based across the area. Three of the full-time staff are dedicated to work with primary schools.

The first programme promoted among schools by the primary team was a walking initiative throughout September 2005, involving all upper primary school children

^g <http://www.sportscotland.org.uk/ChannelNavigation/Our+activities/TopicNavigation/Active+Schools>
Accessed April 2007

(P4-P7: ages 7 to 11 years) across the authority – approximately 1,500 pupils. The aim of the project was to raise awareness among the pupils of how much walking they were actually doing and of ‘how such a simple activity (could) help their overall health and fitness’.

The pedometer project

The Active Schools (primary) team constructed an imaginary ‘Western Isles Way’ spanning the distance between key points at the northernmost and southernmost tips of the region. The team was reliant on staff within the 38 primary schools to ‘buy in’ to the project and administer it directly with the pupils. Pupils were encouraged to walk enough miles to complete the distance of the virtual route during the month. Every pupil was given a pedometer at the start of the school day to count the number of steps taken before returning the pedometer at home time. PE and football sessions were excluded. The project took place during school time only in order not to disadvantage those pupils who were unable to walk to school because of the large distances involved.

Pedometers were funded directly from the Active Schools Cluster budget, as the main project for the first school term. Because of the large numbers of pedometers (2,000 were purchased), a basic model of device was chosen, which measured step-counts only. The counts were translated into distance by using an estimated average step length.

Immediately before the month started, one week’s baseline data was collected. This involved pupils recording their daily step-counts on individual recording tables. After the baseline week, pupils were issued with their own ‘Western Isles Passport’, including a step-count table and a map of the imaginary route. This enabled individual progress along the route to be plotted on a daily basis. Three different levels of individual certificates were awarded by schools at the end of the month, each level reflecting a specific total number of steps achieved.

A school-level incentive involved each school calculating the average number of steps per pupil. The school with the highest average number won a free half day at their local Sports Centre. The incentive was designed to take into account the wide variation in school size. Staff involved with participating classes were also invited to take part, following the same rules as the pupils. All of these staff had their names entered in a prize draw.

A resource pack was created for schools, which was as comprehensive, detailed and ‘user friendly’ as possible, so that the additional work for teachers was minimized. In addition to instructions on practicalities, the pack included background information on purpose of the project and suggestions for motivating pupils. These included facts about local places of interest passed by the path, with ideas for exploiting the potential for exploration of cross-curricular themes (e.g. geography, science, history and maths).

Members of the Active Schools team supported the project by visiting all schools early in the month to energise participating staff and pupils. This included activity-based sessions with pupils as a practical basis for discussion of wider health and

fitness benefits of exercise. In particular, they ran a session based on comparing details of likely stride-lengths of the world's tallest man (eg foot size, leg length etc) with their own situations.

Practical challenges

As with case study 1, one of the main challenges was the amount of work involved for teachers and, in this case, the variable amount of support needed (over and above the support pack and basic visits) in order to generate and maintain enthusiasm among the 38 schools, particularly where schools and/or individual members of staff were less immediately enthusiastic.

“It’s crucial that somebody somewhere is enthusiastic about it – is positive and supportive – and if that isn’t coming straight away it’s very easy for something to go on the back burner.” (Active School Coordinator)

It was not always immediately evident which schools had not ‘bought in’ and the geographical and demographic nature of this rural, island region sometimes restricted the degree of back-up nurturing which the three Active Schools Coordinators could provide. Planning visits could be logistically challenging: timetable commitments within individual schools could mitigate against efficient travel-planning when visiting a number of schools in one area.

Practical limitations of the pedometers also proved to be problematic - in particular the ease with which the reset button could be pressed by mistake, causing a reset to zero. This could be especially de-motivating if it happened during the latter part of the day, before the step-count was registered.

Finally, the weather caused a major challenge. Statistically, September is apparently one of the two driest months in the Western Isles year but, unfortunately, September 2005 was an exception, being persistently rainy. Creative ways had be found to counteract the consequent limits to outdoor activity (and the resetting problem), such as offering ‘bonus steps’ for ‘active playtime’, swimming and PE lessons.

Project outcomes

In addition to the challenges as detailed in the previous section, the amount of work and complexity involved in rigorously tracking progress of so many individual children and groups, proved to be prohibitive in statistically analysing impact during the course of the five weeks. However, the project team felt that, in the circumstances, reported average step-counts were encouragingly high: schools recorded counts which were mostly in the range of 90,000 to 100,000 over the twenty days, and the total distance covered by all 1,500 participants was reported to be more than 50,000 miles (twice the circumference of the earth).

Furthermore, internal evaluations by Active Schools staff reported anecdotal evidence of positive educational and behavioural impact among the participating pupils:

“During follow up visits, Active Schools staff received generally a positive response to the project. The majority of pupils said that they were enjoying taking part and that the project was making them more aware of walking and the part it could play in their daily physical activity programme.” (Active School Coordinator)

In addition to this general finding, a number of individual examples of positive impact were reported, both in terms of teacher creativity and pupil activity. Examples of impact within schools included class teachers building the project into cross-curricular learning: one who used daily updates on class step-count averages as an integral part of maths lessons; another who used the ‘places of interest’ landmarks as a focus for historical study. There were also a number of reports of long-term impact, such as one teacher who has, as a result of the project, established an annual sponsored walk for pupils at her school.

Although the project did not specifically target less active pupils, the team described particular satisfaction at a range of individual stories of the project’s impact on pupils who were hitherto disengaged from physical activity. For example:

“Teachers in (X) School were impressed by one pupil in particular who is normally fairly lethargic and inactive. He was very keen on the project and ‘went for it’ which meant that he was more active during the school day. The headteacher commented on how his energy levels had increased and that she could see a real difference in him.” (Active School Coordinator)

The project team leader reported that a number of less active pupils requested the opportunity to go for a walk, using the pedometers, as an alternative to their normally minimal participation in PE lessons. He felt that the pedometer-related activity provided the necessary motivation and target being *‘something they could do on their own, at their own speed, without feeling incompetent’*.

It was felt by Active Schools staff that the level of participation of teachers had an important impact on pupil motivation. Although there was no specific evaluation of the impact on pupils of teachers registering as full pedometer-wearing participants, it was noted that the highest levels of step-counts tended to correlate with schools who had shown most enthusiasm.

Future plans

Because of the positive feedback, including a number of requests from local schools for another pedometer-related intervention, it is likely that a further project will be undertaken some time in the future. The team leader expressed a firm view that providing variety in such interventions is essential in order to engage and maintain pupil interest. He therefore envisages that the team will devise a different type of project – as yet undecided.

Whatever is decided, they intend to explore new ways of overcoming some of the challenges identified above, including new ways of encouraging enthusiasm among

schools and of identifying earlier, and being more immediately responsive to, less enthusiastic schools.

In order to prevent the kind of practical problems experienced with the pedometers themselves, the team leader suggested that a central method of sourcing such items would be beneficial, in terms of suitability for purpose and general efficiency. He proposed two possible methods: that products could be tested centrally and a guide provided of pros and cons of each model or, alternatively, that one recommended model could be produced at a competitive price.

“You know, we’re all doing similar things and if there was a central method of sourcing these items that we’re all using, that we could learn from other people’s mistakes... You probably would get a better price and a better product and more confidence that it was going to work.” (Active School Coordinator)

Case Study 3: ‘Schools on the Move’ Pilot, The Youth Sport Trust

Background context

The Schools on the Move (SoM) Project was established to stimulate, increase and sustain young people’s participation in physical activity, using pedometers as a motivational tool. Jointly funded by the Department of Health and the Department of Education and Skills in England, and managed by the Youth Sport Trust (YST), with input from the British Heart Foundation, it has both educational and behavioural objectives within health and physical activity contexts:

- To increase levels of activity, particularly walking, undertaken by young people;
- To raise awareness, among teachers and young people, about the role of physical activity in maintaining health and wellbeing;
- To demonstrate how areas of school life can play a positive role in encouraging young people to be more active;
- To increase the profile given to physical activity in schools and to enhance health promotion work undertaken by schools.

(from a YST presentation on the SoM project)

Central to the project is an interactive website^h, through which pupils can enter daily pedometer readings and track their personal step-count progress. The site invites pupils to choose between a number of personal challenges, involving both step-count and distance measures (for example, ‘how far round the world?’, ‘how far up a mountain?’). Teachers also have access to the site, enabling them to track progress of individuals, classes and year groups and to target intervention accordingly.

Another fundamental aspect of the project is the preparatory training provided to nominated lead teachers within each school (who are not always PE teachers) before pedometers are distributed to pupils. The training covers familiarisation with website resources, ideas for embedding physical activity into the curriculum and whole school

^h <http://www.schoolsonthemove.co.uk/public/index/index.htm>

ethos. Lead teachers are expected to cascade the training to teachers of participating classes within their respective schools, and to encourage colleagues to register as pedometer-wearing participants themselves.

The YST has a particular commitment to pupils who are less active and those who are disadvantaged (e.g. socio-economically or because of disability) and are therefore especially interested in targeting these groups whenever possible and appropriate.

The SoM Pilot Project

SoM was piloted in 2006 in the form of a seven month-long project among 2000 10-13 year old pupils from fifty four schools in England. Nearly all of the schools already had a working relationship with Youth Sport Trust and, as such, had already demonstrated commitment to developing physical activity within their curriculaⁱ.

Lead teachers at the preparatory training session demonstrated a range of enthusiasm and creativity levels. Trainers hoped that the sessions would challenge and positively alter less enthusiastic attitudes:

“I think what we are trying to do with the training is challenge some of the staff’s perceptions before we even get to challenging the children’s perceptions, the young people’s perceptions.” (YST Development Officer)

Basic-level pedometers, recommended by the Department of Health, were chosen for distribution to pupils and volunteer staff in participating schools. Pupils were expected to wear the pedometers out of school time as well as during school, so that weekend and evening activity could be included. While the pedometers had facilities to provide information on calories burned as well as step-counts and distance, calorie-related information was not used. Schools were encouraged to provide time for pupils to input their data into computers during the school day, as a class and/or an individual activity.

An evaluation, undertaken by researchers at Middlesex University^j ran in tandem with the pilot, collecting quantitative step-count data from all participants and qualitative information from informants within a selected sample of six of the schools. This enabled changes to activity levels to be monitored during the course of the project, as well as feedback elicited on the impact of, and opinions about, the project.

Practical challenges

The volume of work involved for teachers in administering the project was noted in the evaluation report and reported informally by lead teachers as a challenge – even for those in sports colleges who are likely to accept the work more readily as part of the job:

ⁱ More information on YST school partnerships is available online at <http://www.youthsporttrust.org/subpage/education/index.html>

^j Stathi A, Nordin S & Riddoch C (2006) Evaluation of the “Schools on the Move” project. Middlesex University: London Sports Institute.

“They have said it has been extra work – sort of managing the children’s involvement, trying to persuade other staff members...It does rely on the drive of an individual to get it going. And then it’s almost in the later stage you start getting greater ownership by more members of staff.” (YST development Officer)

The evaluation report highlighted the fact that, while staff found YST materials and training to be very supportive and useful, more ongoing direct assistance would have been beneficial.

A major problem was the number of pedometers which were lost during the course of the project. Some schools predicated this and phased them in over a number of weeks, from half a school day to full days and weekends. Although it meant delaying the inclusion of out-of-school time, it seemed to be effective in reducing the number of pedometers lost.

The project team were acutely aware of the possibility of participants ‘cheating’ by shaking pedometers, recognising that one could never guarantee to fully prevent this and, accordingly, could not claim 100% accuracy in data. However, the team hoped that, by designing the project to be personally challenging rather than competitive and instilling this among teachers in advance, the motivation to falsify results would be minimized:

“The website allows them to set a lone target rather than working to sort of a class average, for example. So if they are very low there’s no compulsion on them to share that...and they get guidance on what they should be trying to aspire to... So hopefully that diminishes the need to shake them because you are generally trying to plot your own progress rather than somebody else’s.” (YST Development Officer)

Technical problems with the website, including reports of ‘freezing’, and difficulties in finding enough computer access time during school hours, were reported as demotivating for some pupils. It had been envisaged that pupils would universally have regular access to the internet during the day, but this proved not always to be the case. School holidays caused particular problems for those without internet access at home, and in terms of general momentum:

“...it’s Christmas...waiting for presents and stuff and you forget about the steps...” (pupil comment, from Stathi et al, 2006, p24)

Bad weather, seasonally-restricted daylight hours and general length of the project were also reported as problematic.

The statistical data from the evaluation report demonstrated a very high project drop-out rate among pupils. From an initial 5832 names registered when first set up, 1996 pupils provided baseline data at the start of the project. This number had dropped to 1469 pupils by week 1, 293 by week 12, 70 by week 23 and to only 31 by week 28. While likely reasons for this can be guesstimated (such as the affect of issues described above), limitations to funding meant that the project evaluators did not specifically explore causes. Consequently, YST are addressing this in other ways, as described in the final section below.

Project outcomes

The SoM evaluation showed that those who maintained involvement in the project increased their step counts during the project, thus meeting the main objective of increasing physical activity. There was also evidence of greater impact among those who came within the 'low-active' category at baseline stage. This particularly applied up to the 12-week stage, where the 'low-active' group had increased their step counts at a greater rate than 'high-active' pupils. However, the high drop-out rate mitigated against the generalisability of these results. In fact, so few pupils regularly entered data after the 23rd week, that weeks 24-28 Of the project were not included in the findings.

In terms of information from the six case study schools, while only 27% of the pupils were able to give correct information about recommended step-count levels, the evaluation reported that SoM had increased the amount of discussion and interest in physical activity within schools. Nearly all of these pupils reported that the pedometers motivated them to engage in higher levels of moderate activity than before.

Teacher participation in the project was reported to have had a positive effect, both through wearing pedometers and following the same protocol as the pupils, and by organising special activities which directly supported the project. Support from families and other pupils were also described as positive influences. While there were problems with access to the website, as described above, there was also evidence that, where these problems did not exist, pupils found using it to be motivating and enjoyable.

Around a third (35%) of the sample indicated a longer-term intentional impact, in that they stated that they would definitely maintain walking. Both 'intrinsic motivation' and enjoyment of the project correlated with this expressed intention. Again there was seen to be a greater impact among less active pupils, who reported more positive attitudes and longer-term impact than the 'high-active' group. However, the take-up was again an issue, with a third of the 490 questionnaire returns from the six case study schools providing insufficient data to be included in analyses. Three quarters of the 322 who did return valid questionnaire data were girls – the group also reported to be less active and to enjoy activity less.

Thus, while the evaluation reported interesting findings, it left unexplored a number of areas which YST are keen to address, for example, reasons for the high drop out rate:

"...what I would like to do is to find out the 'why'...Because if the 'why' is that the children were being active anyway and just didn't need the pedometers or the website as a catalyst, then we have succeeded...So, if they've dropped off the website but their physical activity has increased and been maintained, fantastic."
(YST Development Officer)

Other areas include exploration of cross-curricular application and impact among disabled pupils. In addition to the formal evaluation, YST staff have held a series of

informal discussions with lead teachers, which have been informative about likely reasons for drop-out and for anecdotal evidence in other key areas, on which to build plans for the future. For example, feedback showed that the cross curricular ideas had been applied by teachers in a 'hit and miss' way. This seemed largely to equate with the fact that the project started after curriculum planning for that school year had already been done. At the time of writing, a major review meeting with this group was planned.

Future plans

The next phase of the project will be a larger, similar project, refined and developed on the basis of learning from the pilot and from the review meeting. Training for teachers from the 250 schools taking part in phase 2 will begin in June 2007, with the project itself due to start in September. The new schools include approximately half of the pilot group, enabling these schools to capitalise on their experience. All schools will be in areas with low ratings in the deprivation index.

The following is a selection of specific developments, which aim to address the drop-out rates and other points raised above:

Teacher support:

- YST intend to boost the initial training for lead teachers and provide more ongoing support to schools, to boost the process of 'cascading';
- It is expected that the lead teachers network will become the main forum for development of ideas and good practice exchange;
- The 'public' part of the website is to be developed, to enable more sharing of practice among health practitioners in schools.

Development of cross curricular activities

- By starting at a different time of the year, it is hoped that teachers will be more able to build cross-curricular activities into their timetables.

More concentrated project periods

- The idea of 'short bursts' of pedometer use is to be explored (e.g. phases of 10-12 weeks), in order to address the assumed connection between drop out rates and school holidays/general length of project.

Preventing loss of pedometers

- Ideas for reducing numbers of lost pedometers will be taken forward (such as 'tagging' the devices to keep better track of them).

Technical improvements

- A more powerful website server (with a bigger choice of interactive games) is to be installed, to solve the demotivating technical problems;
- There is also an intention to share ideas, within the teacher network, for improving pupil access to the internet.

Targeting of specific groups

- In addition to the socio-economic weighting already planned (by school locations), it is intended that less active and disabled pupils will be more specifically targeted.

Widening the scope

- Teachers are to be given more choice in how the programme is implemented, within the context of a range of other complementary activities, aiming at harmonizing activity measures where actions (such as swimming and cycling) cannot be measured by pedometers.
- It is intended that the ongoing evaluation will widen the remit from a focus on website data to including the pedometer data in a broader tracking of behavioural change among pupils:

“I really want to look at behaviour change. You know, is [the project] doing what we want it to do, which is increasing children’s levels of participation? ...It’s not good if they are using the website and putting sets in if, the second they stop, they stop doing physical activity.”

(YST Development Officer)

If there is one overall message arising from the Schools on the Move pilot, it appears to be the intention to optimise the potential of pedometers as a motivational tool, while making sure that they are perceived as a short-term catalyst, rather than as an end in themselves:

“Our ultimate aim is to get the most sedentary kids active. That’s really our objective. The pedometers is a tool to do that with. So the pedometers themselves are not the end point.” (YST Development Officer)

APPENDIX

List of contacts for scoping study

(1) List of initial contacts made

UK

Countryside Council for Wales
Loughborough University (Evaluation of Schools on the Move with British Heart Foundation)
Schools on the Move
Sheffield Hallam University (Evaluation of the Women's Sport Foundation pedometer project)
Treasure Trails, Wales
Walking the Way to Health
Women's Sport Foundation

Scotland

Heriot-Watt University School of Life Sciences
Learning and Teaching Scotland
NHS Health Scotland
Paths to Health
Physical Activity and Health Alliance
Scottish Health Promoting Schools Unit
SportScotland /Active Schools
Stonelaw High School, Rutherglen
Sustrans
Youth Sport Trust

Edinburgh

Edinburgh Leisure
Edinburgh Active Schools
Edinburgh Health Promoting Schools
Edinburgh Eco Schools

(2) Networks used for distribution of email requesting information

Scottish national networks

Active Schools
Physical Activity and Health Alliance Network
School Travel Coordinators
Paths to Health network

Edinburgh networks

Edinburgh Active Schools network
Health Promoting Schools, Edinburgh
Eco Schools network, Edinburgh

Other

Countryside Council for Wales network of projects

(3) Example of email distributed to school networks

Dear colleague

Pedometer scoping study

I am working part-time during March/early April on a short study of current pedometer-based programmes in the UK. The study is directed by Jo Inchley, Assistant Director of the University of Edinburgh's Child and Adolescent Health Research Unit (CAHRU).

I am gathering as much information as possible on initiatives where school pupils are encouraged to wear pedometers. I would be very grateful for any information about pedometer use in your schools. It doesn't matter how small-scale or informal the programme is, please do get in touch with me, as I would still be interested to hear about it.

I can provide further information about the study if this will be helpful.

Looking forward very much to hearing from you.

Best Wishes

Marian Grimes
Research Associate
Simon Laurie House
Moray House School of Education
The University of Edinburgh
Holyrood Road
Edinburgh
EH8 8AQ