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ORIGINAL ARTICLE

Increasing children's physical activity: a peer modelling, rewards and pedometer-based intervention

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Background/Objectives: To evaluate a peer modelling, rewards and pedometer-feedback intervention designed to increase children's physical activity and which uses the same behaviour-change principles underlying the Food Dude Healthy Eating Programme.
Subjects/Methods: The study was conducted in two primary schools in Wales. Participants were 47 children (21 boys, 26 girls) from the experimental school and 53 children (29 boys, 24 girls) from a matched control school, aged 9–11 years. Children in the experimental school took part in the intervention; over 8 days they were introduced to fictional role models (the Fit n' Fun Dudes) via visual and audio intervention materials and received small rewards when their daily pedometer step counts increased by 1500 steps per day relative to their baselines. Pedometer measures were taken from children in both schools at baseline, intervention (baseline 2 for the control school) and 12-week follow-up.
Results: Among experimental girls, steps per day were significantly higher during the intervention ($14\,686 \pm 2540$) and at follow-up ($13\,737 \pm 3288$) compared to baseline ($10\,864 \pm 2481$, $P<0.001$) and control girls ($P<0.005$). Experimental boys showed significantly higher daily steps during the intervention compared to baseline ($16\,237 \pm 4204$ cf. $13\,452 \pm 3258$, $P<0.001$) and control boys ($P<0.005$). There were no significant differences between activity levels of experimental and control boys at follow-up.
Conclusions: The intervention resulted in substantial increases in children's physical activity, which was well maintained over a 12-week period in girls.
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Keywords: children; physical activity; role models; rewards; step counts; maintenance

Introduction

Child obesity is increasing rapidly in many countries throughout the world (Rudolf *et al*., 2001; Ogden *et al*., 2002). Preventing its development from an early age is a major research priority and such efforts should focus on children's food intake and physical activity (Dietz and Gortmaker, 2001).

Previous research shows that a peer modelling and rewards intervention, known as the Food Dude Programme, produced large and long-lasting increases in children's consumption of fruit and vegetables (Horne *et al*., 2004; Lowe *et al*., 2004). The peer-modelling element revolves around the 'Food Dudes', a group of fictional peers who frequently eat and extol the virtues of fruit and vegetables and are presented to children via a series of video adventures. Daily rewards, such as Food Dude stickers and pencils, are also awarded to children for eating target amounts of fruit and vegetables. Previous studies have shown that the largest increases in consumption occur among the poorest eaters and that the combined procedure of video peer modelling

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and rewards is more effective compared to either of the two components used alone (for a full description of the Food Dude Programme, the theoretical rationale and research findings see Horne *et al*., 1995, 1998, 2004; Lowe *et al*., 1998, 2004).

The present paper reports for the first time on an application of this intervention model to increase children's levels of physical activity. A high proportion of British children are not undertaking the recommended hour per day of moderate–intensity physical activity (Gregory and Lowe, 2000) with girls consistently shown to be less physically active than boys (for example, see Trost *et al*., 2002; Jago *et al*., 2005). Research indicates that the behaviour-change principles employed in the Food Dude Programme (that is, peer modelling and rewards) should also be effective at increasing children's activity levels. There is evidence that children and adolescents are influenced to be physically active by significant others in their social environment. For example, a detailed observation study in a school playground found that children were highly compliant to prompts to be active from their peers (McKenzie *et al*., 1997). Other research indicates that peer support, encouragement and joint physical activity participation are correlated with higher activity levels in children and adolescents (Sallis *et al*., 2002; Davison and Schmalz, 2006; Springer *et al*., 2006). However, this evidence is predominantly correlational. In order to show causality, controlled studies are needed that isolate peer modelling as a key independent variable and measure its effects on children's physical activity. To date, no experimental studies have attempted to systematically introduce peers (fictional or live) as role models for physical activity in an intervention context. The present study should begin to address this gap in the literature through the introduction of fictional peers (the Fit n' Fun Dudes) who act as role models for physical activity and prompt and encourage active lifestyles.

With respect to rewards, there is a body of evidence indicating that children's physical activity increases when its occurrence is rewarded using tangible items (for example, baseball tickets; Epstein *et al*., 1995) or access to high-preference activities (for example, television viewing; Goldfield *et al*., 2000). Rewards appear most effective in increasing behaviour when their presentation is explicitly tied to clear goals (Cameron *et al*., 2001) therefore, in the present context, the individual needs to be able to accurately monitor his or her progress towards a specified level of physical activity. One way of achieving this is through the use of activity monitors, such as pedometers, which provide a total count of accumulated movements or steps. The use of these monitors enables the setting of activity goals, which individuals can then be instructed to reach in order to access a reward. For example, in a study by Goldfield *et al*. (2000), obese children were instructed to accumulate either 750 steps or 1500 steps during a 20-min laboratory session in order to earn 10 min of television viewing time. Results showed that, during the session, children in the 1500 group were significantly more active than children in the 750 group, who were in turn more active than control children. This approach was then shown to be effective at increasing the physical activity of sedentary children over a 6-week period in the natural environment; in this study, the children's access to television was made contingent on achievement of a target number of counts on a Biotrainer accelerometer (where 400 counts earned 60 min of television time; Roemmich *et al*., 2004). A further study showed that obese children exposed to this contingency over an 8-week period showed significantly greater increases in daily physical activity than did control children who wore activity monitors to gain feedback on activity level but without behavioural goals or reward contingences (Goldfield *et al*., 2006). Such findings indicate that rewards combined with activity goals are effective above and beyond the effects of simply being able to monitor one's physical activity. However, the studies described above were small-scale trials and no longer-term follow-up data are provided.

The aim of the current study was thus to determine the feasibility and acceptability of a school-based physical activity intervention founded on the behaviour-change principles employed in the Food Dude Programme (combined peer modelling and rewards). During the 8-day intervention the children heard a song, which they were told was recorded by the Fit n' Fun Dudes. These fictional characters were presented as a group of 'cool' and physically active children. Fit n' Fun Dude letters were also sent to the children to tell them they would receive a reward each time they achieved their personalised daily step targets, which specified an increase of 1500 steps per day over each child's baseline daily step count. The intervention was immediately followed by a maintenance phase during which no rewards were presented but children continued to wear pedometers and self-recorded their daily step counts. The maintenance phase was included in order to ensure a gradual thinning out of extrinsic reinforcement for physical activity through the use of occasional Fit n' Fun Dude letters and a certificate. To our knowledge, this is the first time that peer modelling, rewards and pedometer step targets have been used in this way to promote physical activity behaviour change in children. It was predicted that the intervention would increase levels of physical activity in participating children and that these increases would be maintained at 12-week follow-up, relative to baseline levels of activity and in comparison to a control group.

Method

Ethical approval

Granted by the School of Psychology Ethics Committee, University of Wales Bangor.

Schools and participants

Two Welsh primary schools were recruited to participate in the study and were randomly assigned to either the

experimental or the control condition. The experimental and control schools were similar in terms of size (281 and 240 pupils aged 4–11 years, respectively), geographical location (semi-rural), physical education provision (two timetabled sessions per week plus football, rugby and netball as extracurricular sports) and deprivation level (14 and 15% free school meal entitlement, compared to the national average of 17%).

The study participants were 9–11 year old children attending the two schools. This age group was targeted because pre-adolescence has been identified as a high-risk period for obesity development (Wardle *et al*., 2006), and research shows that children's activity levels decline markedly with age during elementary school (Trost *et al*., 2002). In addition, the intervention procedures, such as the setting of pedometer targets and use of self-monitoring diaries, were deemed more developmentally appropriate for older children who would have the cognitive abilities to comprehend and complete such tasks.

Experimental design and procedure

Participants were assigned to the experimental or control groups on the basis of the school they attended. Assignment by schools was necessary in order to minimise cross-contamination. The study consisted of a number of experimental phases: baseline, intervention/baseline 2, maintenance and 12-week follow-up.

Baseline (week 0). Pedometer measures of total steps per day (steps/day) were taken from the experimental and control groups on 8 school days (over 2 school weeks). Participants in both groups were told that they were part of a study looking at current levels of physical activity in children. Measures of height and body mass were also taken.

Intervention/baseline 2 (weeks 1–2). Only participants in the experimental group took part in the intervention, which was implemented over 8 school days spanning a 2-week period. On day 1, the Head Teacher read a letter said to be from the Fit n' Fun Dudes to all participants. The letter contained general encouragement to be physically active as well as instructions concerning the intervention procedures. Each child received his or her daily step target via a personalised letter from the Fit n' Fun Dudes. Targets were determined by each participant's baseline level of physical activity and required an increase of 1500 steps per day (this increment corresponds to approximately 15–20 min of moderate–intensity activity; Goldfield *et al*., 2000). Thus, a child who averaged 10 000 steps per day during baseline would be given a target of 11 500 steps per day at the start of the intervention. Participants also received a copy of the Fit n' Fun Dudes song on compact disc and a homepack was distributed which included a picture of each Fit n' Fun Dude character and the lyrics of the song. Parents were informed of the intervention procedures via an information letter that was enclosed within the homepack. All of these intervention materials are available from the corresponding author on request.

On each day of the intervention participants needed to have reached or exceeded their step target in order to qualify for the day's reward. These were inexpensive, Fit n' Fun Dude customised items such as balls and frisbees. Participants were able to open their pedometers whenever they wished to monitor their progress towards their targets. Pedometers were checked by the researchers upon the children's arrival at school each morning and rewards were distributed to children who had reached or exceeded their targets along with standardised verbal praise (for example, 'Well done, you passed your target today'). Children who had not reached their targets were encouraged to keep trying. Pedometers were then reset by the researchers and participants were required to reach or exceed the step target by the following morning. The researchers recorded each child's pedometer count on the 8 school days of the intervention.

Simultaneous (baseline 2) physical activity measures were taken in the control group for whom no intervention took place. Control participants continued to be told that they were part of a study looking at current levels of physical activity and were unaware of the intervention procedures in the experimental school. In both schools, provision of physical activity opportunities (that is, physical education lessons, extracurricular activities) continued as usual and no changes were made to these in the course of the study.

Maintenance (weeks 3–14). The maintenance phase immediately followed completion of the intervention and aimed to support participants in maintaining their increased activity levels. Participants in the experimental group self-recorded their daily step counts in provided Fit n' Fun Dude diaries. They were prompted to continue reaching their targets via personalised letters from the Fit n' Fun Dudes sent during weeks 3, 9 and 13. Fit n' Fun Dude certificates were awarded to children who completed their diaries at the end of the phase. Two 'mystery prizes' (Fit n' Fun Dude T-shirts) were awarded to the boy and girl who had increased by the most number of steps on average, relative to baseline. There were no maintenance procedures in place in the control school.

Follow-up (weeks 15–16). Follow-up measures were taken 12 weeks after the intervention or baseline 2 in experimental and control groups, respectively. Physical activity in both groups was measured over 8 school days using pedometers.

Measures

Physical activity. Yamax Digiwalker SW-200 pedometers (Tokyo, Japan) were used to measure each participant's total steps per day. Prior to beginning the study, the accuracy of all pedometers was verified via a 50-step walk test.

On the first day of each measurement phase (baseline, intervention/baseline 2, follow-up), the researchers distributed

pedometers to the participants at the beginning of the school day (at around 0900 hours). All units were set to zero. Participants were instructed to wear the pedometers at all times throughout the day apart from swimming, bathing and sleeping. Parents were provided with forms to record the duration of any time periods that pedometers were not worn. Upon the participants' arrival at school on the following morning (between 0830 and 0900 hours), the researchers recorded the accumulated step counts and reset the pedometers ready for the next measurement day. Data were collected in this way from Monday morning until Friday morning. The children did not attend school on weekend days, so on Friday morning the pedometers were collected by the researchers and retained over the weekend. Thus, each of the 8-day measurement phases spanned 2 school weeks in total. For the duration of the study in the control school, and during the baseline phase only in the experimental school, pedometers were sealed with cable ties and counts were not revealed to the participants (when recording pedometer counts, the researchers simply said 'thank you' to each child and no other feedback was given). Being able to view the pedometer count was an integral part of the intervention however, so pedometers were unsealed in the experimental school during the intervention measurement. Pedometers remained unsealed during the follow-up measurement to allow experimental participants to continue with the maintenance procedures.

Anthropometric assessment. Body mass (to the nearest 0.1 kg) and height (to the nearest 0.1 cm) were measured without shoes using a Hanson electronic scale and a tape measure attached to a vertical wall, respectively. Each participant's body mass index (BMI, $kg\,m^{-2}$) was then computed.

Data analysis

Any days where the pedometer was not worn for more than 2 consecutive hours (according to the parent recording forms and verbal reports from school staff) were discarded. Participants needed to have at least 3 days of pedometer data in each of the three measurement phases to be included in the analysis; previous research indicates that 3 weekdays of pedometer measurement provide a reliable estimate of children's physical activity (Ozdoba *et al*., 2004).

For each participant, mean steps per day was computed during baseline, intervention/baseline 2 and follow-up using the pedometer data from the last 3 days of each measurement phase. Any missing data were replaced with data from the previous days of measurement within each phase. Data were analysed using SPSS Version 11 for Macintosh. Baseline descriptive statistics were computed for all variables and 2-factor analysis of variance (ANOVAs) were used to analyse sex and group differences. Time and group effects on physical activity were analysed for each sex separately in a 3 (baseline, intervention, follow-up) $\times 2$ (experimental, control) repeated measures ANOVA. Significant time $\times$ group interactions were followed up using independent *t*-tests for group comparisons at each time point. Within-subject changes over time were examined using one-way repeated measures ANOVAs, conducted for experimental and control groups separately, followed by simple main effects tests. All *post hoc* tests were adjusted for multiple comparisons using the Bonferroni adjustment. An alpha level of 0.05 was used for all other statistical tests.

Results

Descriptives

In total, 47 children (21 boys, 26 girls) from the experimental school and 53 children (29 boys, 24 girls) from the control school received written informed consent from their parents or legal guardians to participate in the study. These represented 58 and 72% of children who were eligible to take part, respectively. The reason for the higher response rate in the control school is not clear but it is possible that children attending this school received more encouragement to participate from school staff relative to the experimental school.

A further nine participants (six boys, three girls) from the experimental group and two participants (one boy and one girl) from the control group were excluded from the analysis due to their having an insufficient number of days of pedometer data during each of the three phases (see Data analysis section above). Missing data were due to school absence, losing or forgetting to wear the pedometers and children leaving the school. Excluded children did not differ significantly from the remaining experimental and control group samples on baseline age, height, mass or BMI ($P>0.05$ in all cases).

Baseline characteristics of the final sample are shown in Table 1. Overall, boys were significantly more active than girls, $F(1, 85)=13.77$, $P<0.001$, but there was no difference between the experimental and control groups and no sex by group interaction. There were no significant sex or group differences on mean age, height, mass or BMI ($P>0.05$). For both girls and boys, the percentage of overweight or obese participants on the basis of published international cut points (Cole *et al*., 2000) did not differ by group (Fisher exact $P=0.445$ for girls, and 1.000 for boys, two-tailed tests).

Girls' physical activity

Figure 1 shows the mean daily step counts of girls in the experimental and control groups during baseline, intervention/baseline 2 and follow-up. The ANOVA revealed a significant interaction between time and group, $F(1.8, 77.7)=21.41$, $P<0.001$. *Post hoc* analysis showed no significant difference between the two groups at baseline ($t=-0.89$, $P=0.377$); however, at both intervention/baseline 2 and follow-up, experimental girls had significantly higher step counts compared to control girls ($t=-7.10$, $P<0.001$ and $t=-3.51$, $P=0.001$, respectively). Within-

Table 1 Baseline characteristics of the final included sample by sex and group (mean ± s.d.)

	Boys		*Girls*	
	Experimental (n = *15*)	*Control* (n = *28*)	*Experimental* (n = *23*)	*Control* (n = *23*)
Age (year)	9.9 ± 0.7	10.2 ± 0.6	10.0 ± 0.7	9.9 ± 0.6
Physical activity (steps per day)	13 452* ± 3258	12 318* ± 3474	10 864 ± 2481	10 265 ± 2050
Height (cm)	139.3 ± 5.9	140.4 ± 6.4	138.7 ± 7.1	140.9 ± 6.1
Mass (kg)	37.2 ± 7.4	35.7 ± 6.3	34.4 ± 7.2	38.2 ± 7.5
BMI (kg m^{-2})	19.1 ± 3.5	18.0 ± 2.5	17.7 ± 2.4	19.1 ± 2.7
Overweight/obese[a] (% participants)	27%	22%	14%	25%

Abbreviations: BMI, body mass index; s.d., standard deviation.
*Boys greater than girls, $P<0.001$.
[a]Determined using international age-specific cut points for overweight and obesity (Cole *et al.*, 2000).

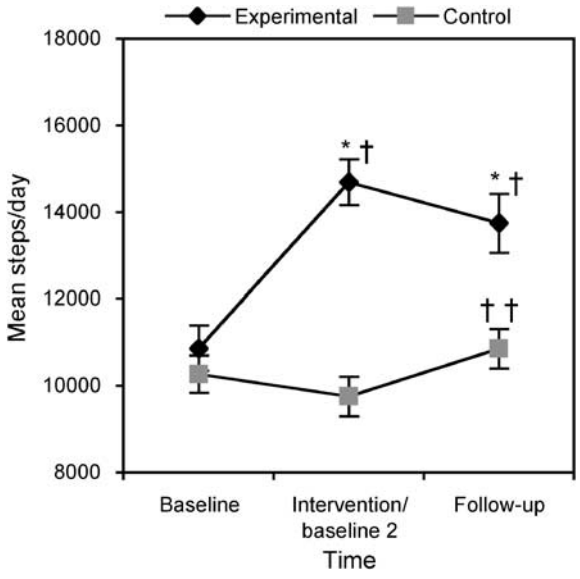

Figure 1 Mean steps per day of girls at the three time points. Bars represent ±1 s.e. of the mean. *Experimental > control, $P=0.001$; †significantly greater than baseline, $P<0.001$; ††significantly greater than baseline 2, $P<0.05$.

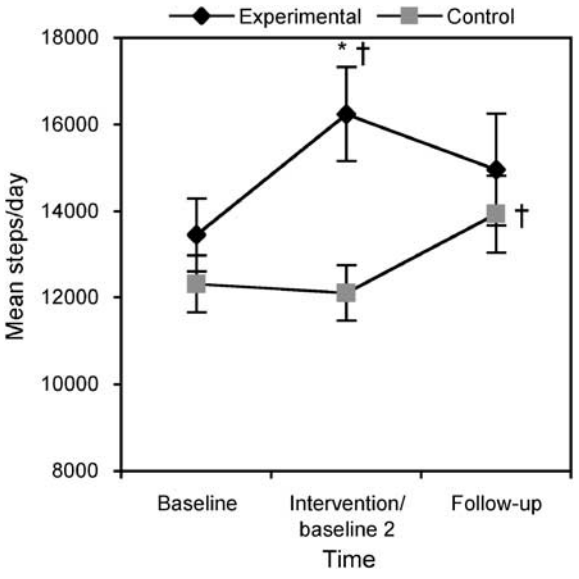

Figure 2 Mean steps per day of boys at the three time points. Bars represent ±1 s.e. of the mean. *Experimental > control, $P=0.001$; †significantly greater than baseline, $P<0.001$ and $P<0.05$ in experimental and control groups, respectively.

subject comparisons on the experimental girls' data showed a significant main effect of time, $F(2, 44)=26.66$, $P<0.001$. Main effect tests revealed that step counts were significantly higher at intervention ($P<0.001$) and follow-up ($P<0.001$) compared to baseline, but there was no difference between intervention and follow-up ($P=0.346$). In control girls, there was also a significant main effect of time, $F(2, 44)=4.30$, $P=0.02$, with significantly higher step counts at follow-up compared to baseline 2 ($P=0.044$) but no differences between baselines 1 and 2 ($P=0.256$) or between baseline 1 and follow-up ($P=0.502$).

Boys' physical activity

Comparable data for the boys are shown in Figure 2. There was a significant interaction between time and group, $F(1.8, 71.9)=5.85$, $P=0.006$. *Post hoc* analysis showed that experimental boys were significantly more active than control boys during the intervention/baseline 2 phase, respectively ($t=-3.48$, $P=0.001$), but there was no difference between the two groups at baseline ($t=-1.04$, $P=0.304$) or follow-up ($t=-0.67$, $P=0.510$). In the experimental group of boys, there was a significant main effect of time, $F(1.4, 19.8)=6.06$, $P=0.015$, with significantly higher daily steps during the intervention relative to baseline ($P<0.001$), but no difference between baseline and follow-up ($P=0.457$) or between intervention and follow-up ($P=0.468$). In control boys, there was also a significant main effect of time, $F(2, 54)=5.18$, $P=0.009$, with significantly higher step counts at follow-up compared to baseline 1 ($P=0.044$) but no differences between baselines 1 and 2 ($P=1.00$) or between baseline 2 and follow-up ($P=0.053$).

Discussion

The current results indicate the efficacy of a peer modelling, rewards and pedometer-feedback intervention in increasing the physical activity of 9–11 year old children. During the 8-day intervention, both girls and boys in the experimental group showed substantial increases of 3822 and 2785 steps per day over baseline, respectively (35 and 21% increases). Such increases correspond to more than 30 min of additional moderate–intensity physical activity per day (on the basis of Goldfield *et al*. (2000)).

By the 12-week follow-up measurement, girls in the experimental group continued to produce an additional 2873 steps per day (26% increase) on average. In contrast, experimental boys did not maintain their increased activity at follow-up relative to baseline and it is possible that the pedometer self-monitoring procedures employed during the maintenance phase (that is, the use of Fit n' Fun Dudes diaries) were more popular among girls than boys. It is notable that of the 15 boys in the final experimental group sample, only two boys regularly completed the maintenance diaries whereas 9 of the 23 girls did so. Children generally have a long history of receiving reinforcement (for example, praise) for 'doing well' and achieving high scores, yet it is possible that girls are more sensitive to these reinforcers so for them the diary recording procedures may have had a greater motivational impact. Boys were more active than girls at the start of the study and increased to over 16 000 steps per day during the intervention, so it is possible that they had reached a ceiling level, which was more difficult to maintain over time. There was also more variability in the boys' data as indicated by the larger s.d. However, the individual means at follow-up show that this was attributable to one highly active boy (mean = 27 638 steps per day) because the range of mean values was otherwise similar for girls and boys (8108–21 885 and 8327–21 013 steps per day, respectively). There is also some evidence that girls are more responsive to physical activity and nutrition programmes than boys (Vandongen *et al*., 1995; Sallis *et al*., 1997). While further research is required to determine the consistency of this gender difference and the factors responsible for it, the importance of physical activity maintenance cannot be overstated because children are most likely to experience health benefits if active lifestyles are maintained over time.

The current intervention is unique in its use of peer modelling, rewards and pedometer step targets in order to promote physical activity behaviour change in children. Although the Food Dudes research showed that the combined peer modelling and reward intervention was considerably more effective in increasing fruit and vegetable consumption than either component used alone (Lowe *et al*., 1998), the effects on physical activity of each component of the Fit n' Fun Dudes intervention have yet to be determined. A further study is currently being conducted to investigate the effects of the peer modelling and pedometer target procedures in the absence of rewards.

There were also significant changes in the physical activity of control children over the course of the study with higher activity levels at follow-up, compared to the previous phases. This increase is likely to reflect seasonal differences in children's activity levels because, while baseline and intervention/baseline 2 measures were taken in the winter (November and December), follow-up measures were taken during spring (March) when the warmer temperature and lighter evenings may have been more conducive to outdoor play. Previous research has documented substantial monthly variation in children's activity levels; furthermore, spending time outdoors is associated with greater physical activity (Baranowski *et al*., 1993). Nevertheless, in the current study, experimental girls remained significantly more active than their control counterparts at follow-up indicating that the intervention was effective above and beyond any natural variation in children's physical activity.

The use of pedometers with children does entail certain practical problems. Circumstances that were beyond the researchers' control such as child absenteeism from school, forgetting and losing pedometers and accidental resets all led to missing data points and, in some cases, subject exclusion. In addition, as with all motion sensors, the pedometer is unable to adequately capture activity levels during swimming and cycling. Nevertheless, these difficulties are offset by the importance and value of obtaining objective measures of physical activity particularly when evaluating interventions in order to more accurately detect behaviour change. This is in contrast to many studies in the literature that have assessed physical activity via self-report and there is indeed now widespread concern about the validity of such measures due to children's limited recall skills (Rowlands *et al*., 1997; Welk *et al*., 2000).

The non-participation of several children in the target age range is an issue for studies of this kind. This was driven in the present study by the absence of written informed consent from the parents. The intervention was implemented by researchers rather than teachers and did not have much effect on teaching time so its impact on non-participating children should have been minimal. Nevertheless, although not always possible in research situations, it is highly desirable to include all eligible children in school-based interventions; it makes for ease of administration, ensures that all children are targeted including those who would normally opt out of physical activity programmes (for example, overweight children), and effects may be even greater if all children, teachers and the school itself are on board.

The current study represents the first test of this pilot intervention. Although it was relatively short in duration at 8 days, strong intervention effects were attained and these were well maintained over a 3-month period in girls. However, basic learning principles suggest that longer exposure to an experimental contingency may result in better maintenance of effects. In future trials, a longer intervention and maintenance period should be used and

may consolidate children's above-target performance leading to better maintenance of increased physical activity in the longer term. It also appears highly beneficial to involve parents in such interventions due to the strong influence of parental support, modelling and encouragement on child physical activity (Sallis *et al*., 1999; Davison and Schmalz, 2006; Springer *et al*., 2006). In the current study, parents were included via a home pack and information letters, but future research should seek to enhance parental involvement perhaps by giving parents their own pedometers and daily step targets in order to promote modelling. Finally, the procedure of collecting pedometer data at school meant that it was not possible to measure or target physical activity on weekend days. Several studies, however, have shown clear differences between children's weekday and weekend physical activity levels (Rowlands *et al*., 1999; Trost *et al*., 2000) so the inclusion of weekend days in future studies of this intervention is of importance.

Future research should also determine the effects of the intervention on children of differing weight status (that is, obese, overweight). Recent data indicate that pre-adolescence is a higher risk period for obesity development than adolescence, which suggests that preventive programmes should be aimed at primary school children (Wardle *et al*., 2006). The ultimate aim of this research programme is thus to combine the current physical activity intervention with the existing Food Dude programme, which has been shown to produce substantial and long-lasting increases in children's fruit and vegetable consumption (Horne *et al*., 2004; Lowe *et al*., 2004). The resultant two-pronged approach ('the Fit Food Dudes Programme') could play a key role in child obesity prevention if implemented widely.

In conclusion, the current study demonstrates for the first time that a peer modelling, rewards and pedometer-feedback intervention is effective in increasing levels of habitual activity in 9–11 year old children, though further refinement in the procedure may be necessary to ensure long-term maintenance of behaviour change in boys. It is thus possible to apply the behaviour-change principles employed in the Food Dude Programme to successfully modify a completely new behaviour. The findings of this initial evaluation represent the first step towards development of a combined healthy eating and physical activity intervention programme.

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