Promoting health-enhancing physical activity in the primary school: a pilot evaluation of the BASH health-related exercise initiative

S. J. Fairclough1,2*, G. Stratton1,3 and Z. H. Butcher1,2

Abstract

The ‘Be Active Stay Healthy’ (BASH) health-related exercise (HRE) programme was delivered to Year 5 students (age 9–10 years) in two primary schools situated in the same area of a northwest England town. BASH aims to improve students’ participation in and knowledge of HRE through structured physical activities. Fifty-five students completed pre- and post-programme HRE knowledge and understanding questionnaires. Moderate to vigorous physical activity (MVPA) levels of 13 students were assessed using accelerometers during two contrasting lessons focusing on optimal activity levels (active) and cognitive learning (cognitive). Mean percentage of correct questionnaire answers improved from 60.8 to 83.8% ($P = 0.0001$, effect size (ES) = 1.44), and questionnaire performance was significantly better among students in one of the schools ($P = 0.017$, ES = 0.72). Boys engaged in MVPA for 11% more time than girls during the active lessons ($P = 0.0006$, ES = 1.21) but MVPA during cognitive lessons was similar. The BASH programme has potential to use structured physical activity as a medium to enhance students’ HRE knowledge, particularly in relation to the fundamental understanding of healthy and active lifestyles. HRE knowledge may differ between schools, even when they are similarly sized and located, with analogous student catchment areas. Recommendations for the future delivery and evaluation of the programme are made.

Introduction

Schools are key environments for promoting health-enhancing physical activity [1–3] as children spend ~40–45% of their waking hours there. The school physical education curriculum is perceived to be important to physical activity promotion both within lessons and beyond the curriculum by providing students with appropriate knowledge, skills and attitudes to lead physically active lifestyles [4]. One aspect of physical education that addresses both these principles is health-related exercise (HRE). HRE’s purpose is to enhance students’ knowledge, understanding, skills and awareness of physical activity and exercise [5]. According to the English National Curriculum for Physical Education (NCPE), HRE should be delivered within physical education lessons from ages 5 to 16 years [6]. However, the status of HRE is often marginalized as teachers tend to focus their expertise, available curriculum time and resources on other more ‘traditional’ activities, such as team games [7].

To improve teachers’ HRE expertise, resources and interventions in the form of activity cards, lesson plans, teachers’ handbooks and curriculum guidance have been developed to exemplify progressive and structured lesson delivery [5, 8–10]. While such approaches have the potential to improve the quality of HRE teaching and learning,

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doi:10.1093/her/cym093
their effectiveness is unclear as evaluations are seldom conducted. The purpose of this paper is to report on the pilot evaluation of one such primary school HRE initiative.

Method

The Be Active Stay Healthy Initiative

The Be Active Stay Healthy (BASH) initiative is a five-lesson HRE unit of work which is delivered on a rotational basis in primary schools within one northwest England town. The programme aims to improve Year 5 students’ participation in and knowledge of physical activity and healthy lifestyles. The unit of work is prepared and taught within physical education curriculum time by one dedicated physical activity coordinator employed by the local Children’s Services department. The coeducational lessons are practical based and emphasize motor development, physical activity and cognitive learning. Furthermore, the permeation of HRE knowledge through the practical activities is central to each lesson. Pilot evaluation data were collected in two primary schools (termed ‘School A’ and ‘School B’) over the same continuous 5-week period spanning September and October 2005. The schools were similarly sized and located, with analogous student catchment areas [11].

Participants

Data were obtained from 55 Year 5 students (aged 9–10 years; School A: 15 boys, 9 girls; School B: 18 boys, 13 girls). Parents returned signed informed consent for their children to participate in the evaluation, which received ethical approval from the University ethics committee. Students’ heights and weights were measured by a trained investigator to obtain body mass index (BMI) values.

Instruments

Health-related exercise knowledge and understanding questionnaire

Prior to the first and fifth BASH lessons students completed an 11-question multi-choice knowledge and understanding questionnaire, relating to HRE themes. According to a group of experts in this area, the wording of the questionnaire demonstrated satisfactory content validity. Students indicated their response to each question by circling one of three possible answers.

Physical activity during lessons

Physical activity levels of a randomly selected subsample of 10 students from each school (five boys, five girls) were assessed during two BASH lessons per school. One lesson (active) was designed to elicit maximum levels of activity and focused on aerobic dance. The other lesson (cognitive) aimed to improve the students’ understanding of the circulatory system through a practical circuit activity which represented the journey of the blood around the body. Physical activity was measured every 5 s using ActiGraph accelerometers (model GT1M, ActiGraph, LLC, Fort Walton Beach, FL), which were attached to the students’ waistbands on their right hips. The amount of time that students engaged in moderate to vigorous physical activity (MVPA) was determined using cut-points of \( \geq 163 \) counts per 5 s epoch [12]. The percentage of lesson time students spent in MVPA was calculated and used in the subsequent analyses.

Data analysis

To assess if there had been any improvement in HRE knowledge and understanding, McNemar tests were applied to nominal data from each individual question. Differences in the percentage of correct answers were analysed by school, gender and questionnaire occasion using repeated measures analysis of variance. The percentage of lesson time spent in MVPA was compared separately between schools and genders using one-way analyses of covariance, with BMI included as the covariate. Effect sizes were calculated where appropriate, using the weighted pooled estimate of the standard deviation (SD) [13]. Descriptive data are mean ± SD except where stated and statistical significance was set at \( P < 0.05 \). Analyses were conducted using SPSS 12.0.1.
Results

HRE knowledge and understanding questionnaire

Completed pre- and post-BASH questionnaires were available from 46 students at the end of the programme (23 boys, 23 girls). Nine students had incomplete data because of absence on one or both of the days when the questionnaires were administered. These data were not included in the analyses. Improvement was demonstrated for 10 of the 11 questions, with pre–post differences in seven of them reaching statistical significance (Table I). Overall, the mean percentage of correct answers improved after the BASH unit from 60.8 ± 14.7% (pre) to 83.8 ± 12.4% (post; \( F_{1,42} = 81.5, P = 0.0001 \), effect size (ES) = 1.44). Questionnaire performance was significantly better among students in School A than in School B [mean and 95% CI: 75.9% (71.6%, 80.2%) versus 67.8% (62.8%, 72.8%); \( F_{1,42} = 6.2, P = 0.017 \), ES = 0.72]. Boys’ and girls’ scores were the same (71.9%), and there were no significant interaction effects.

Physical activity during BASH lessons

Physical activity data were available from seven boys and six girls. Data attrition was due to student absence on either one or both of the two BASH lesson days and in two cases, ActiGraph malfunction. The age, physical characteristics and physical activity levels of the 13 students are presented in Table II.

No significant differences in MVPA were observed between schools, though School B students engaged in most MVPA during the active lessons (44.9 ± 9.5% versus 34.0 ± 8.3%). In the cognitive lessons, School A students were slightly more active (19.5 ± 2.0% versus 17.1 ± 2.9%). There was a significant main effect for gender during the active lessons (boys: 46.6 ± 7.1%; girls: 35.2 ± 10.0%; \( F_{1,12} = 11.4, P = 0.006 \), ES = 1.21) but not during the cognitive lessons (boys: 18.4 ± 2.0%; girls: 18.2 ± 3.5%).

Discussion

The 23% increase in students’ HRE knowledge and understanding supports the effectiveness of the BASH initiative. These improvements were most likely influenced by the short programme duration and focused delivery. As cognitive aspects of learning were improved through the practical medium of physical activity, this ‘discrete’ approach to teaching HRE may hold promise for teachers. However, in the absence of a HRE Programme of Study, this style of delivery is not advocated in the NCPE [14]. As a result, schools often apply ad hoc approaches by permeating HRE messages within more established

<table>
<thead>
<tr>
<th>Question no.</th>
<th>Pre-BASH correct answers (%)</th>
<th>Post-BASH correct answers (%)</th>
<th>Difference (%)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Why do we need to exercise?</td>
<td>91.3</td>
<td>100</td>
<td>8.7</td>
<td>0.125</td>
</tr>
<tr>
<td>2. What does it mean to be healthy?</td>
<td>69.6</td>
<td>97.8</td>
<td>28.2</td>
<td>0.0001</td>
</tr>
<tr>
<td>3. What is stamina?</td>
<td>69.6</td>
<td>95.7</td>
<td>26.1</td>
<td>0.0001</td>
</tr>
<tr>
<td>4. How much moderate exercise should we do each week?</td>
<td>50</td>
<td>82.6</td>
<td>32.6</td>
<td>0.001</td>
</tr>
<tr>
<td>5. What should we do before exercising?</td>
<td>84.8</td>
<td>97.8</td>
<td>13</td>
<td>0.07</td>
</tr>
<tr>
<td>6. Description of balanced diet</td>
<td>56.5</td>
<td>87</td>
<td>30.5</td>
<td>0.001</td>
</tr>
<tr>
<td>7. What effect of exercise is most important?</td>
<td>95.7</td>
<td>93.5</td>
<td>-2.2</td>
<td>1.0</td>
</tr>
<tr>
<td>8. Why do we warm-up?</td>
<td>93.5</td>
<td>100</td>
<td>6.5</td>
<td>0.25</td>
</tr>
<tr>
<td>9. What should we do when stretching?</td>
<td>50</td>
<td>87</td>
<td>37</td>
<td>0.0001</td>
</tr>
<tr>
<td>10. What are the roles of the lungs, arteries and veins?</td>
<td>15.2</td>
<td>45.7</td>
<td>30.5</td>
<td>0.003</td>
</tr>
<tr>
<td>11. Label the muscles of the body</td>
<td>0</td>
<td>34.8</td>
<td>34.8</td>
<td>0.0001</td>
</tr>
</tbody>
</table>
activities and sports [7]. The greatest cognitive improvements related to health and physical activity themes that the students were exposed to on a regular basis, such as physical activity guidelines, warming-up and appropriate diet. Conversely, fewer than half of the students correctly answered ‘higher order’ questions, which represented abstract concepts (i.e. basic physiology), scientific terminology and factual recall. These concepts may require further cross-curricular reinforcement to come within the capabilities of the majority. It is plausible that improved HRE knowledge and understanding will influence students’ physical activity attitudes and choices as they progress through the school years [15]. Yet, as few studies have assessed the association between physical activity knowledge and participation in children, it is difficult to assess how likely this is [16].

For students to be optimally active during physical education, it is advocated that they engage in MVPA for at least 50% of lesson time [3, 5]. Interventions designed to increase physical education activity time have generally met this criterion [17, 18], and so it was expected that this would be the case during the active lessons, which focused on aerobic dance to maximize MVPA and required minimal class management. While the boys’ MVPA values approached this threshold (46.6%/14.5 min), the girls (35.2%/10.9 min) were significantly less active. These discrepancies may have been associated with various gender-differentiated factors, such as aerobic fitness (i.e. maintaining the required intensity of work to keep to the pace [19]), interest or motivation [20] or motor skills (though at this age girls usually have superior balance and coordination than boys; [19]). Alternatively, socio-cultural differences between the girls and boys may have contributed. Cockburn [21] described how girls’ perceptions of the ‘physical’ nature of physical education (i.e. ‘getting out of breath’) were a significant reason for them not enjoying lessons. It is possible that some girls may have been put off by the apparently vigorous nature of the active lessons and as a result participated at a lower intensity. The similarities in boys’ and girls’ MVPA during the cognitive lessons were anticipated, because the lessons focused on knowledge and understanding, and included less complex physical movements performed at a lower intensity. As a result, the cognitive lessons were less physically demanding than the active ones, and levels of MVPA (18%/7 min) were substantially lower than those typically reported during primary school physical education [22]. However, this trade-off between activity and knowledge should be viewed favourably as an improved understanding of the relationship between activity and health could subsequently help develop positive attitudes to physical activity.

Inter-school differences in knowledge and understanding were unexpected as students in the two schools came from similar catchment areas of the same town. These findings illustrate that individual school environments can differ greatly, even when located in geographically similar locations. To overcome the potentially confounding nature of these differences, it has been recommended that the school is used as the unit of analysis when data are collected from multiple sites [23, 24]. This was not possible in this pilot evaluation as a sample size of two would not have been statistically feasible.

The BASH initiative has potential to improve students’ short-term HRE knowledge and understanding through structured physical activity, which can complement other elements of the physical education curriculum. Such practical approaches may be most effective if lessons focus on HRE themes that students are regularly exposed to. MVPA differed between students when the lessons emphasized

### Table II. Age, physical characteristics and physical activity data of students with complete accelerometer data

<table>
<thead>
<tr>
<th>Gender</th>
<th>n</th>
<th>Age (years)</th>
<th>Stature (cm)</th>
<th>Body mass (kg)</th>
<th>BMI (kg m(^2))</th>
<th>Active MVPA (% lesson time)</th>
<th>Cognitive MVPA (% lesson time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>7</td>
<td>9.3 ± 0.2</td>
<td>134.6 ± 0.04</td>
<td>29.6 ± 2.9</td>
<td>16.4 ± 1.2</td>
<td>46.6 ± 7.1</td>
<td>18.4 ± 2.0</td>
</tr>
<tr>
<td>Girls</td>
<td>6</td>
<td>9.4 ± 0.2</td>
<td>134.0 ± 0.05</td>
<td>30.2 ± 5.5</td>
<td>16.8 ± 2.6</td>
<td>35.2 ± 10.0</td>
<td>18.2 ± 3.5</td>
</tr>
</tbody>
</table>
high levels of activity, suggesting that greater differentiation is required to facilitate optimal activity from all students. A strength of the programme was its delivery by a specialist physical activity coordinator. Previous studies have demonstrated how specialists are better able than classroom teachers to engage students in physically active learning [25]. However, BASH may be more sustainable if lessons are eventually taught by permanent classroom teachers who have undergone specific training to achieve the programme goals [26]. This approach might better ensure continuity and development of BASH as teachers may feel as if they have more ownership of the initiative.

Limitations

This pilot evaluation was limited by its small and non-randomized sample, which makes generalizing the findings to other schools and students problematic. Furthermore, the lack of a comparison group causes uncertainty that the improvements in knowledge and understanding occurred as a direct result of the BASH programme.

Research-based evidence has been provided to inform the BASH programme’s future development. Too often investment is made into the design and implementation of resources and initiatives but without structured evaluation which is an important consideration for public health officials [26]. In light of the evaluation process, the following recommendations are made:

1. Teachers should be involved in the planning and delivery of the programme with the support of the physical activity coordinator
2. Follow-up measures should be taken to assess the medium and long-term impact of the programme
3. Evaluation should include other measures to account for inter-individual differences (e.g. intrinsic motivation, perceived competence, motor skill, etc.)
4. A measure of habitual physical activity should be included to assess the impact of BASH beyond the curriculum
5. A randomized-control design and school-level data analysis should be utilized with a larger sample of schools

By employing these recommendations, a more robust intervention and evaluation could be conducted with medium and long-term outcome measures. However, as local physical activity promotion initiatives are resource dependent, at the present time it is unclear to what extent these recommendations will be fully implemented.

Funding

Youth Sport Trust.

Acknowledgements

We would like to thank the students and teachers in the two participating schools and Heather Sharrock and Sarah Linton of Blackpool Children’s Services.

Conflict of interest statement

None declared.

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Received on April 11, 2006; accepted on October 30, 2007