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Research Article

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Can Selected Physical Activity Improve Self-perceptions Psychosocial Aspects in Children

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ABSTRACT

Physical activity programmers are considered to hold psychosocial benefits for children and young people. In this relatively unpopulated research area, investigation of exercise variables (type, duration, frequency) and their impact upon a range of psychosocial variables is needed. Effects of a six-week aerobic program intervention for pre-adolescent children, with scores for school connectedness below the average score for their school, upon their self-concept regarding their emotional and behavioral well-being. This study reports an experimental evaluation of the effects of a 10-minute daily, six-week, aerobic exercise programme ('Wake up, Shake up') on the self-perception of emotional and behavioural adjustment of primary school children. Participants (N=71; age 8 to 11 years) with scores below the average 'school connectedness' score for their school were randomly assigned to an experimental (aerobic exercise), comparison ('Circle Time') or control condition. The intervention reduced pupils' perceptions of their emotional and behavioural difficulties. Selected Physical Activity programmes are recommended as an intervention to enhance aspects of Improve Self-perceptions psychosocial aspects (emotional and behavioural well-being) for children in this age group. The need for further research on the effects of exercise programmes for this age group, and for developing reliable assessment measures, is highlighted.

Keywords: Physical activity; Self-perceptions; Children

INTRODUCTION

The outcomes from physical activity in childhood are significant in public health terms, and researchers have highlighted a range of potential physical health benefits in childhood, and longitudinally [1,2].
Within educational provision physical activity programmes are, therefore, widely proposed [3-6]. Exercise in childhood has also come to be regarded as an opportunity to enhance a variety of psychosocial outcomes [7]. Growing evidence indicates reduced psychological dysfunction and improved well-being as the correlates of increased levels of exercise participation [1,7]. However, the precise nature of the relationships among variables requires further investigation [2].
Research examining the relationship between exercise and psychological health in non-adult populations has drawn strongly on cross-sectional surveys and longitudinal designs [9-11], and this dependence on cross-sectional methods has signalled the need for the control of participation factors such as type (aerobic/anaerobic), frequency, duration and intensity of exercise participation upon outcomes [1,12]. Whilst some causal associations between selected specific variables are available from controlled studies, divergent conclusions from this relatively small evidence base again indicate the need for further investigation [1,2], and for the elaboration of theoretical insights [13]. Overall, therefore, the psychosocial benefits of exercise in childhood is a developing terrain which continues to indicate that school-based programmes require careful consideration of both programme variables and hypothesized outcomes [14].

The psychosocial benefits of exercise have been variously described as the potential enhancement of prosocial behaviours and positive interactions in children and young people [15], levels of maturity and social competence [16], reduction of social and emotional problems [11,17,18] self-esteem enhancement [19-22]. Potential cognitive gains have also been explored but only slight if any effects upon academic attainment have been identified [23,24]. The diversity of the evidence base, particularly when reviewed for effect size (Ahn & Fedewa, 2010) highlights the differential effects of programme variables [25].

The general domain for this study was that of self-concept, a term used interchangeably with that of self-esteem [26]. The evidence in this area is again diverse, and shares difficulties in definition and measurement common to conceptions of well-being [19,26,27]. Studies investigating the relationship of exercise participation to self-esteem broadly point to positive gains. For example, Boyd and Hrycaiko (1997) identified significant increases in global self-esteem following additional strength training and cardiovascular (aerobic) exercise [28]. Crews et al. (2004), identified that the more demanding an aerobic exercise programme the greater the increases in self-esteem reported [29]. Slutzky and Simpkins (2009) suggest a positive association between group participation and selfconcept outcomes [21].

Aerobic exercise is not straightforwardly associated with high self-esteem in children. For example, relating self-esteem and self-perceptions to aerobic exercise interventions of five and six weeks respectively, Daley and Buchanan (1999), and Burgess et al. (2006) found an association between aerobic exercise and significant improvements in children's self-perceptions including selfworth, athletic competence and body attractiveness [19,20]. Yet Walters and Martin (2000) found children aged between 7 and 11 years who were engaged in intensive aerobic exercise over a period of 13 weeks did not show significant improvement in self-concept compared with children who took part in a minimal aerobic exercise programme (although the presence of a 'ceiling effect' could have underpinned these results, where both groups scored well above average on both pre and post measures) [22]. Burgess et al. (2006) have also questioned aspects of the measurement of self-concept on the basis that preadolescent children may be less likely to be socially aware of their physical appearance than adolescents [19]. Self-esteem is, therefore, indicated as a highly relevant dependent variable from exercise in childhood, but one which, again, appears sensitive to participant characteristics, programme, and measurement.

Background to the present study

The current study, a randomised controlled trial, addressed the call for prospective controlled studies to examine the relationship between exercise variables and psychological health [2,12], in this instance with a focus on self-concept. In doing so, the hope was also to contribute to the body of practice-based evidence which can inform the delivery of effective school-based interventions [1,30-32].

Aligned to the professional identity of the authors as educational psychologists, the study was constructed to explore well-being outcomes for potentially vulnerable pupils. The capacity of exercise programmes to play a role in enhancing psychological resilience and reducing the impact of potential risk factors has been explored, often with a focus on the important mediating factor of self-concept in potentially enhancing resilience [33]. Other studies have explored the outcomes for specific groups perceived as vulnerable [8].

Here, participants were young people identified as having below the average score for school connectedness relative to the population data for the school they attended (see 'Method', below). School connectedness (SC) is a concept which has been used to describe a young person's degree of relating to and participation within school life, and, akin to the notion of school engagement [34,35], has been outlined as depending upon the individual's relating within the social context [36]. School engagement, or connectedness, has been associated with a range of positive outcomes in adolescence and childhood [37-39]; a low sense of belongingness towards school in adolescence has been associated with social, emotional and behavioural difficulties (EBD) (for example, Catalano et al., 2004; Erwin, 2002; Rice et al., 2008; Thomas & Smith, 2004); and, relevant for early intervention models, school bonding has been highlighted as a preventive factor in risk-reduction [30,38,40-42]. The aim of this study, therefore, was to investigate the effects of a six-week aerobic exercise intervention for pre-adolescent children, with scores for school connectedness below the average score for their school, upon their self-concept regarding their emotional and behavioural well-being.

METHOD

Participants

A questionnaire was developed to investigate current exercise interventions utilized within mainstream primary school settings, and an accompanying letter to enquire about levels of interest towards engaging in the research was sent to 41 head teachers in a County region in the Yorkshire and Humberside region of England. From the 23 schools which responded, 17 were involved in one or more exercise programmes, with 'Wake Up, Shake Up'

(WUSU; Mitchell, 2008) recorded as most frequent in use (12 out of 23 schools). As current involvement in an aerobic exercise programme would have invalidated pre-intervention measures, two schools that expressed interest in participation and reported no previous exposure were selected to engage in the research. The two schools held similar profiles as detailed by their most recent Ofsted reports (The Office for Standards in Education, Children's Services and Skills). Free school meal data and the proportion of students with special educational needs or disabilities was reported as being 'considerably below' the national average. To determine the target population, students aged 8 to 11 years across the two schools completed the School Connectedness Scale (SCS), developed from the US National Longitudinal Study of Adolescent Health [43]. Whilst the scale is standardized on adolescent populations, it has been employed elsewhere with preadolescent groups [39] and was considered the 'best-fit' measure for this study. The scale consists of five items with a school connectedness (SC) score derived from responses to five, five-point Likert scale statements which required participants to indicate their level of agreement with the following: *'I feel close to people at this school'*; *'I feel like I am part of this school'*; '*I am happy to be at this school'*; *'The teachers at this school treat students fairly'*; *'I feel safe in my school'*. The target population were students who achieved an SC score that was 'below average' when individual scores were compared against the 'mean' SC score for their respective school. Mean SC score was 21.40 (Scoring range: Min=5; Max=25). The number of children who originally completed the SCS was 339 students. Seventy-one children participated in the research (SC=<21). This did not assume equivalence of the participant groups in each school (since SC scores are likely to be influenced by contextual as well as individual factors).

Checks for group equivalence were carried out at the analysis stage, below. Following the application of an inclusion/exclusion criterion that accounted for the health and attendance of participants, and number of completed pre and post-intervention measures, the total number of participants in the research was 71. Ethical considerations and practices were followed in accordance with British Psychological Society guidelines including informed consent and right to withdraw for all participants, ensuring no potential to harm to participants and the confidentiality and anonymity of data [44].

Interventions

Participants were randomly allocated to an experimental (WUSU) (N=26), comparison (Circle Time) (N=22) or control group (N=23). WUSU is a universal health aerobic exercise programme designed for school aged pupils where routines are performed to lively music in order to utilize major muscles, strengthen joints, increase muscular endurance and revitalize the body for the school day (Mitchell, 2008). The 10-minute intervention including warm-up, a routine and cool-down, was delivered on a daily basis by two different adult members of staff in each of the respective schools, for a period of six weeks. The music and, therefore, the routines were changed at the start of each week. Along with materials to refer to, consultation sessions were held in order to provide on-going support for staff. On this occasion, treatment fidelity measures, although considered, were not possible.

Participants assigned to the comparison group received 'Circle Time', an adult-led intervention consisting of games, role-play and discussion that aims to encourage supportive feedback from child to child and teacher to child to bring about positive changes in self-concept and pro-social skills [45,46]. Circle Time, in line with WUSU implementation, was delivered by the same adults (two from each respective school) on a daily basis. In line with the experimental condition the focus of each week changed, with six scripts based on activities from 'Developing Circle Time: Taking Circle Time Much Further' [47], made available for the implementers to use. Control group participants followed their daily routines within school.

Measures

The Strengths and Difficulties Questionnaire (SDQ) [47] was used to assess participants' perceived emotional and behavioural adjustment. It served a purpose here both as a routine outcome measure facilitating comparisons across studies [30] and as a means to investigate changes in perceived well-being. The 25-item SDQ comprises five subscales, the first four of which relate to potential emotional and behavioural difficulties (EBD)– 'emotional symptoms', 'conduct problems', 'hyperactivity', 'peer problems' and 'prosaically behavior', with each subscale consisting of five statements. Participants were required to indicate their agreement with items using either the terms 'not true', 'somewhat true' or 'certainly true'. A total EBD score was calculated from the sum of the first four subscales, with the pro-social scale score being omitted. A maximum score for perceived total EBD was 40 with a minimum of 0. For each subscale a maximum score was 10, with a minimum of 0. Although the self-completed version of the SDQ [48,49] was originally developed for adolescent children age 11 years and over, Muris et al. (2004), in a study of 1111 children age 8 to 13 years investigated the psychometric properties of the scale in relation to younger children [50]. With the younger age group the reliability (internal consistency) figures were poorer,

reaching an acceptable level for total EBD score but not for the individual subscales. They concluded that the SDQ could provide useful information on children under 11 years but that it should be used with caution.
To complete the questionnaire pre- and post-intervention, participants were withdrawn in groups of between six and eight children with an accompanying adult member of staff. The questionnaire was administered in a quiet classroom environment with participants positioned apart, and was administered verbally to reduce any potential reading difficulties which might have restricted successful and valid completion.

Establishing equivalent groups
A comparison of mean scores across the two participating primary schools prior to the onset of the interventions revealed no significant differences in perceived emotional and behavioural adjustment (F=0.017, p=0.897 with 1 and 69 df). This enabled the researchers to combine data across schools for joint analysis. A comparison of mean scores across the three treatment groups (experimental, comparison and control) also revealed no significant differences (F=0.223, p=0.801, with 2 and 68 df). This supported the assumption that the treatment groups were equivalent prior to the onset of the interventions.

RESULTS

Table 1 shows the EBD scores on the Strengths and Difficulties Questionnaire for all groups. In addition to total EBD scores, the scores obtained on the individual subscales are also shown. However, owing to insufficient levels of reliability for the subscale scores as opposed to the total scores [50], only the total scores have been used in the analysis. The overall mean score on measures of total emotional and behavioural difficulties (EBD) for the six-week period decreased from Time 1 (T1) by 3.08 points for those participants engaged in WUSU, by 1.40 points for tose engaged in Circle Time activities and by 0.30 points for controls. A repeated measures ANOVA revealed a significant difference over time across the three treatment groups from T1 to T2 (F=10.280, p=0.002, with 2 and 68 df).

Table 1: Scores on Strengths and Difficulties Questionnaire (SDQ)

	Emotional symptom		Conduct problems		Hyperactivity		Peer problems		SDQ Total Score	
	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
Experimental (WUSU)	4.65	3.58	3.15	2.08	4	3.69	3.42	2.81	15.23	12.15
Comparison (Circle Time)	5.18	4.5	2.77	2.36	4.45	4.09	3.55	3.59	15.95	14.55
Control	4.17	4.3	3.61	2.83	4.83	5.04	3.7	3.83	16.3	16

One way repeated measures ANOVAs to examine the effect for each independent treatment group over time identified a significant difference for participants in the experimental group (F=15.949, p=0.001, with 25 df), but not for participants in either the comparison group (F=3.004, p=0.098, with 21 df) or control group (F=0.106, p=0.747 with 22 df). A significant interaction effect (Time x Group) between the experimental and control conditions also emerged (F=5.334, p=0.025, with 1 df).

DISCUSSION

This study represents a research initiative by educational psychologists in primary schools in an area of central concern to health and well-being, namely, engagement of pupils in regular aerobic exercise. The results indicate that psychosocial benefits from the programme were achieved over a short period of time. In reviewing the reduction in perceived emotional symptoms identified over the six week intervention period, both psychophysiological and psychological perspectives are relevant. From a psycho-physiological perspective, a number of different biological, chemical and neurochemical mechanisms linking exercise to mood through the mediation of endorphin production, increased body temperature and changes in serotonin and adrenaline transmitting systems have been hypothesised [12]. However, owing to limited evidence to support a causal explanation, psychological perspectives such as the 'feel better effect', relating to exercise participation's role in increasing sense of mastery and control over one's actions are discussed within research literature [12]. Interestingly for school-based research, the exercise experience has been conceptualized as distracting both at an individual level, with exercisers attending to internal mechanisms (Leith, 1994), and environmentally, by participating away from non-stressful environments [51]. Within this study, pupils who engaged in WUSU did so in a non-classroom setting, and it has been suggested that exercise contexts can support children to transfer away from self-debilitating cognitions and instead focus their attention upon tasks presented [9].

The study was subject to a number of limitations, some of which highlight the areas in which further research in this area in relation to children of primary school age is required. First, only one assessment measure, the total EBD score on the self-completion version of the Strengths and Difficulties Scale, proved to be sufficiently robust to be included in the final analysis. Reported reliability coefficients for the individual subscale scores were not at a sufficient level to allow them to be used. Although Muris et al. (2004) have indicated the potential for the SDQ to be used as a measurement tool for children as low as 8 years of age, as all data were derived from self-reported approaches, findings are subject to a number of potential effects including varying amounts of participant attention to items presented, low numbers of item indicators for each construct, inaccurate reporting and follow on effects for supposedly unrelated items, that may have impacted on the validity of concepts measured. It is, therefore, noted that this study would have been strengthened through the use of additional sources of evidence to triangulate results [50]. Additional measures were planned when the study was designed, when it was intended that the focus should be on self-determination theory [52]. With this in view, a modified version of the Basic Psychological Needs Scale was used in an attempt to measure participants' perceived competency, relatedness and autonomy. The modifications were made by the authors for the purpose of this study, to make the language of the scale suitable for children. While the modified scale proved to be amenable to use by children when piloted, the reliability coefficients obtained with the full sample at the pre-intervention stage proved to be insufficient.

Second, while the participants were selected on the basis of being potentially vulnerable, it should be noted that the two schools used in the study were considerably above the national average in terms of socioeconomic data and they had a low number of pupils with special needs. This is reflected in their pre-intervention EBD scores on the Strengths and Difficulties Questionnaire, which were not at a level sufficient to indicate marked emotional and behavioural difficulties. As a general guide, a score of 0 to 15 is viewed as representing 'low need' (80 per cent of all scores), a score of 16 to 19 as representing 'some need' (10 per cent of all scores) and a score of 20 to 40 as representing 'high need' (10 per cent of all scores) [48]. The mean group scores for the children in this study prior to intervention were in the range of 15 to 16. While this does not identify them as a group with 'high need', it does nevertheless point to elevated scores in comparison with the general population, and is consistent with the fact that they had already been assessed as being below average in school connectedness scores. Muris et al. (2004) noted that when they asked teachers to rate pupils as to whether or not they had behaviour problems, those with behaviour problems had a mean EBD score on the self-completion SDQ of 14.1, compared with a score of 9.2 for those without such problems [50]. Overall, however, caution is required in this area, as the sample studied by Muris and his colleagues covered a wider age range (8 to 13 years) and younger children may have higher scores on the whole than older children [53].

CONCLUSIONS

The potential for exercise programmes to be recognised and implemented as interventions promoting positive psychological outcomes within school-based psychology practice is recognised. Although studies have investigated the psychosocial benefits of exercise, diversity in sample, programme and method have rendered causal relationships between programme variables and psychological health difficult to describe reliably.

The data from this study indicate that aerobic exercise (a structured, six-week programme) can serve to enhance self-perceptions of emotional and behavioural adjustment in pre-adolescent pupils with scores for school connectedness below the average for their school. Further research is required in order to establish reliable measures of assessment for this age group and also in relation to the impact of physical exercise on the well-being of pupils with additional support needs.

Miller et al. (2008) identified a role for school-based psychologists, working alongside head teachers or physical education coordinators [14], in the design or adoption of physical education programmes. The authors of this study advocate this potential function for educational psychologists as part of their established role in relation to promoting evidence-based practice at systemic level.

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