

The authors are based at the Research Institute for Sport and Exercise Sciences and the REACH group at Liverpool John Moores University, UK. For communication email: n.ridgers@ljmu.ac.uk

Nicola Ridgers, Gareth Stratton, Lawrence Foweather, Jayne Henaghan, Nicola McWhannell & Mark R. Stone

The Active City of Liverpool, Active Schools and SportsLinx (A-CLASS) Project.

The A-CLASS Project is a unique multi-disciplinary project, which consists of multi-sports activity coaches who will be responsible for running after school and community sports clubs, and four research coaches who will analyse the effects of these programmes on the physical activity levels of Liverpool school children.

Current physical activity guidelines recommend that children engage in at least one hour of moderate intensity physical activity a day (Biddle et al., 1998). There is concern however that a large number of children lead inactive lifestyles (Biddle et al., 2004). Higher levels of physical activity have been linked to lower risks of developing coronary heart disease (CHD), obesity, strokes, hypertension and osteoporosis (Blair & Connelly, 1996). Therefore, from a public health perspective, the promotion of physical activity to children may benefit future health (Blair & Connelly, 1996).

An ideal environment

Schools are regarded an ideal environment to administer health promoting schemes as children spend a large proportion of their school day there, and a health education infrastructure exists through the formal curriculum. The promotion of physical activity to children has generally occurred through physical education, though there is increasing interest in the role of playtime and its effects on daily activity (Ridgers et al., 2005). However, scant attention has been focused on the role of after school clubs provided by schools, and their contribution to physical activity guidelines and the effects on habitual

physical activity. Moreover, the social effects of these clubs on children are not widely known.

Enjoy sport

In Liverpool, children report that they enjoy taking part in sport and activity and want to do more. However, increases in obesity levels, seen since 1998, indicate that the development of a city wide sustainable strategy is needed to benefit children. The development of the Active City of Liverpool, Active Schools and SportsLinx (A-CLASS) Project is borne out of this need, as it aims to offer children after school and community sports clubs, therefore increasing the provision of sport and physical activity opportunities across the city with a specific emphasis on children who are less active and/or overweight. The effectiveness of this approach on children's health, motor skill and habitual daily physical activity will also be evaluated.

The A-CLASS Project

The A-CLASS Project is a unique multi-disciplinary project, which consists of multisports activity coaches who will be responsible for running after school and community sports clubs, and four research coaches who will analyse the effects of these

programmes on the physical activity levels of Liverpool school children. The project is funded by the Neighbourhood Renewal Fund and Liverpool City Council's SportsLinx Project and conducted by the REACH Group (Research into Exercise, Activity and Children's Health) based at Liverpool John Moores University. The REACH Group are undertaking the research in partnership with Liverpool's School Sport Partnerships (SSP) and Primary Care Trusts.

Four aims

There are four main aims of the A-CLASS Project. These are to:

- ~ Assess the effects of activity programmes on children's fundamental movement skills (FMS) and playtime behaviour
- ~ Assess the effects of activity programmes on children's physical activity, health and fitness
- ~ Track the effects of structured exercise activity programmes on children's habitual physical activity over 2 academic years
- ~ Provide out of school hours opportunities and support for children to participate in physical activity

Project Overview

Each research coach will be responsible for one area of the project outlined above. Two projects will focus on Year 4 children, and two projects will focus on Year 6 children. These projects will specifically focus on:

- ~ FMS and physical self-perceptions (Year 4)
- ~ Physical activity levels and behaviour during school playtime (Year 4)
- ~ Cardiovascular risk factors (Year 6)
- ~ Bone health and body composition (Year 6)

One hundred and eighty children will be recruited into the project from Liverpool's four SSPs. Children will be randomly selected from the lower half of the fitness scores obtained by the SportsLinx project in 2004/2005. Participants in each year group will be randomly allocated to one of three groups. Group one's children will receive a structured exercise programme, which will focus on FMS (Year 4) and increasing engagement in high intensity activity (Year 6). Group two will receive a behaviour modification intervention, where participants will be directed towards activity opportunities in the local area and encouraged to decrease sedentary behaviours. Group three will act as the control group.

Four phases

The research programme is divided into four phases and will be conducted over two academic years. These phases are:

- ~ Phase 1 - Initial measures of habitual physical activity levels, health markers, FMS and playtime activity and behaviour collected
- ~ Phase 2 - Structured exercise programme implemented, with habitual physical activity measures obtained at midpoint and end of programme. Measures of health, FMS and playtime behaviour collected at end of programme.
- ~ Phase 3 - Measures of habitual physical activity levels, health markers, FMS and playtime activity and behaviour collected recorded at start of second academic year
- ~ Phase 4 - Structured exercise programme implemented, with habitual physical activity measures obtained at midpoint and end of programme. Measures of health, FMS and playtime behaviour collected at end of programme

Measures taken

Figure 1 (see below) provides a detailed example of the measures that two of the research coaches will undertake and record during each phase of the project. The baseline measures will be taken in January 2006, and the conclusion of the project is anticipated in July 2008.

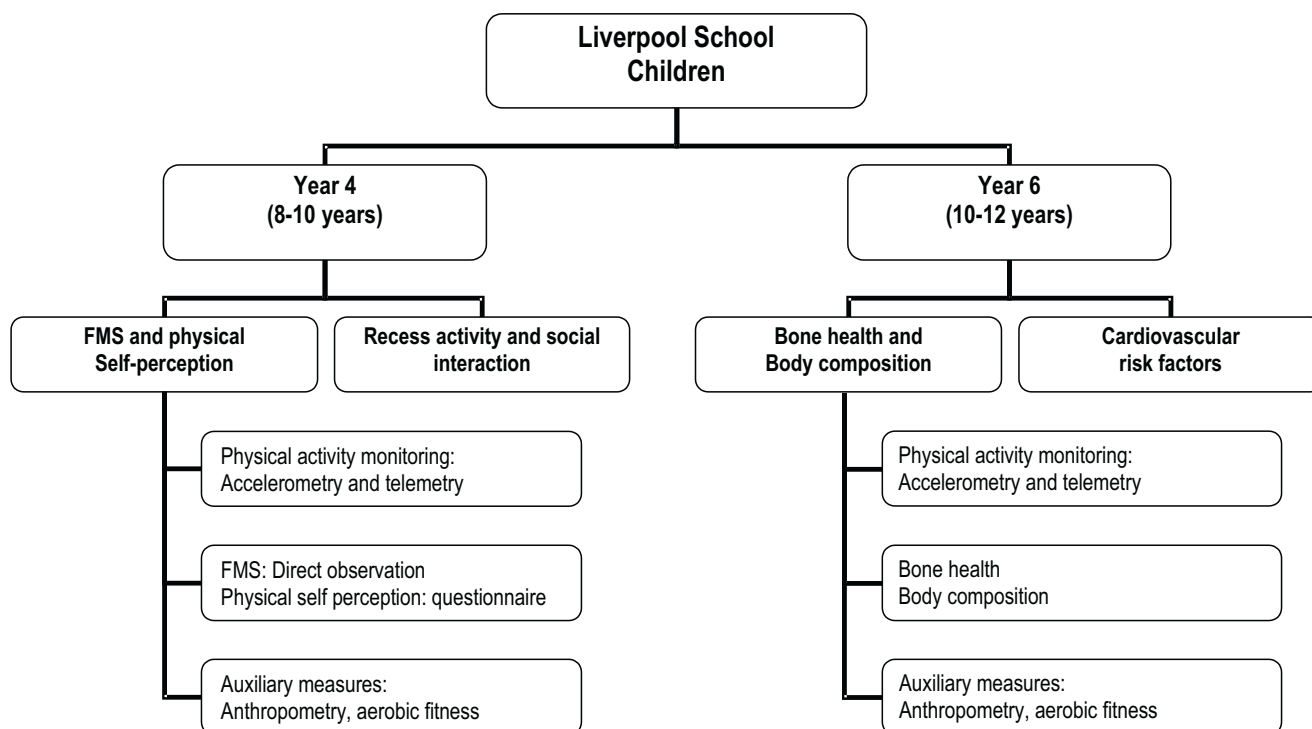
The advantage of this project is that it offers a unique insight into the effects of promoting physical activity to school-aged children on markers of health, FMS, and its impact on playtime physical activity behaviour. Previous data from the SportsLinx project has illustrated that children's fitness levels are low, body fat scores and BMI's are increasing in both boys and girls, and children participate in low levels of physical activity in and out of school hours (Taylor et al., 2003). This project offers the opportunity to investigate the effects of health promoting strategies and inform future approaches which aim to promote physical activity to schoolchildren.

Identifying the Need for the A-CLASS Project

Fundamental Movement Skills (FMS)

FMS are considered the "building blocks for movement. They are the skills which children need to successfully participate in physical activity, games and sport." (NSW Dept. Ed. & Training, 2000, p. 11). The importance of FMS for participation in physical activity is highlighted when examining the reasons given by children for non-participation. Common issues that could be associated with fundamental movement skill deficiency include feelings of incompetence, shame and embarrassment associated with participation, lack of necessary sports skills, and self-consciousness (Biddle et al., 1998).

Figure 1: Overview of the A-CLASS research projects



Studies have shown that children who fail to develop fundamental movement patterns are three times more sedentary than children of the same age (Magill, 1993). Fundamental movement skill competence may therefore be related to diseases and conditions associated with inactivity.

Indeed, overweight boys and girls are less likely to possess high levels of FMS and more likely to possess low levels of FMS (Okely et al., 2004). The teaching of FMS in children is therefore of significant importance, particularly because children who have mastered FMS are more likely to enjoy and be motivated to participate in physical activity. Moreover, failure to master FMS could provide a barrier to physical activity participation in adulthood. Research suggests that children competent in FMS are more likely to have higher levels of self-esteem and confidence, which could have a knock-on effect on other areas of the curriculum in school (NSW Dept. Ed. & Training, 2000).

Playtime

Playtime offers children a unique opportunity to interact with peers, engage in daily physical activity, develop FMS and confidence in their movement (Evans, 1996). Children who do not interact with peers during playtime are likely to report negative social and emotional consequences in adulthood. Furthermore, research suggests that academic performance can benefit from participating in playtime activities (Shephard, 1997). For a more detailed playtime overview, the reader is directed to Ridgers et al (2005).

Previous studies have attempted to increase children's playtime physical activity using games sessions, structured fitness breaks, and playground markings. Physical activity level increases have been reported, yet these studies focused on playtime alone. Dale et al (2000) reported that children who are active during school are more active out of school, yet no empirical research details whether increases specifically in playtime physical activity will benefit out of school hours activity. The A-CLASS project is attempting to answer this question, building on previous work undertaken in the city.

Cardiovascular Risk Factors

Cardiovascular disease (CVD) is one of the most prevalent chronic diseases in Britain, accounting for over 240,000 deaths in 2001 (BHF, 2003). However, physical activity can have a positive preventative impact on CVD (Farrell et al., 1998), as well as providing favourable cholesterol levels, reducing high blood pressure and body weight (Mertens et al., 1998). However, little research has investigated physical activity levels and cardiovascular health risk factors in children. Recent studies, which have

begun to document disease risk in the younger generations, have found fatty deposits in the aortas and coronary vessels of children and young adults (Edmundson et al., 1994), and that children with high blood pressure have a greater risk of developing atherosclerosis in adulthood (Li et al., 2004).

Cardiovascular disease in children may not be as advanced as in older populations. Assessment using standard procedures such as body composition, cholesterol level and blood pressure need to be accompanied by more valid and robust in-depth methods necessary to establish early predictors of the disease (Aggoun et al., 2000).

Assessments of heart size and the depositions of fatty streaks in the main arteries can be made through non-invasive procedures. The use of such techniques has provided consistent growing evidence that cardiovascular risk factors are identifiable in childhood and are predictive of future CVD risk but the impact physical activity interventions has on these is limited. The A-CLASS project aims to evaluate the effects of the physical activity interventions on these cardiovascular risk factors.

Bone Health and Body Composition.

The developmental stages experienced during puberty, particularly early puberty, are the most beneficial for accruing optimum bone health and development. Maximal increase in bone density and lean body mass accrual occurs around 13 years in girls and around 15 years in boys (Van der Sluis et al., 2002). Up to 26% of adult total body bone mineral content is accrued during early puberty in girls usually between 10-12 years (Valdimarsson et al., 2005). A high peak bone mass achieved in childhood/young adulthood reduces the occurrence of fracture and physical limitations associated with fractures, and provides a larger reserve for later life (Egan et al., 2004).

Physical activity can have a positive effect on bone density, mass and mean muscle mass (Wang et al., 2005). The more vigorous and dynamic the activity, the more osteogenic it is considered to be (Parker, 1998). Therefore, moderate-to-vigorous physical activity experienced during this age group will have a positive effect on increasing bone mineral density.

Obesity is another modifiable factor that can influence health particularly with children. In Liverpool, one third of Year 5 and Year 7 children were classified as overweight or obese, and obesity in Year 5 boys has increased by 97% since 1998 (Taylor et al., 2003).

In addition to its detrimental effect on health risks regarding type II diabetes and CHD in children, being overweight and inactive also has a negative effect on bone health as it is reported that there is an association with adiposity and lower bone

mass and higher fracture risk (Wang et al., 2005). However, there is little data that details the longer-term effects of physical activity interventions on body composition and bone health. The A-CLASS aims to investigate this in detail, and hopes to develop a sustainable approach to tackling the worrying statistics concerning health in Liverpool's children.

Conclusion

From an education perspective, the A-CLASS project aims to bridge the gap between practice and science. We want to know whether structured or lifestyle programmes have a similar impact on children's physical activity levels. Results from the project will help to formulate effective physical activity interventions in school age children and to assign key messages about effectiveness and sustainability of these programmes. This is crucial as the promotion of physical activity is a public health priority (Blair & Connelly, 1996).

Sustainable interventions that increase children's habitual physical activity, and improve FMS, bone density and cardiovascular risk profiles, children's social experiences, physical self-perceptions and play behaviour are needed, yet the structure, practicality and feasibility of such projects are not known. The A-CLASS project, working in partnership with the city council, SSP, PCTs and schools themselves, may inform future multi-agency projects which aim to benefit the health of children both now and in the future.

Acknowledgements.

Liz Lamb, Jimmy McGinn (SportsLinx), John Marsden (Active City Liverpool), Suzanne Ramsey, Vicky Marshall, Adella Ball, Gerry Wigglesworth (Partnership Development Managers).

References

- Aggoun, Y., Bonnet D., Sidi, D., Girardet, J.P., Brucker, E., Polak, M., Safar, M.E. & Levv, B.I. (2000). Arterial mechanical changes in children with familial hypercholesterolemia. *Atherosclerotic and Thrombotic Vascular Biology*, 20, 2070-2075
- Biddle, S. J. H., Sallis, J. F., & Cavill, N. (1998). *Young and Active: Physical Activity Guidelines for Young People in the UK*. London: Health Education Authority.
- Biddle, S.J.H., Gorely, T. & Stensel, D.J. (2004). Health-enhancing physical activity and sedentary behaviour in children and adolescents. *Journal of Sports Sciences*, 22, 679-701.
- Blair, S.N. & Connelly, J.C. (1996). How much physical activity should we do? The case for moderate amounts and intensities of physical activity. *Research Quarterly for Exercise and Sport*, 67, 193-205.
- British Heart Foundation, (2003). *BHF Coronary Heart Disease Statistics 2003*. Sep 2003.

Dale, D., Corbin, B.C. & Dale, K.S. (2000). Restricting opportunities to be active during school recess: do children compensate by increasing physical activity levels after school? *Research Quarterly for Exercise and Sport*, 71, 240-248.

Edmundson, E.W., Luton, S. C., McGraw, S. A., Kelder, S. H., Layman, A. K., Smyth, M. H., Bachman, K. J., Pedersen, S. A., & Stone, E. J. (1994). CATCH: Classroom Process Evaluation in a Multicenter Trial. *Education Quarterly*, 2, S27 - S50.

Egan, E., Redmond, L., Turner, C. & Reilly, T. (2004). Bone mineral density in competitive female sports groups. *Journal of Sports Sciences*, 23, 115.

Evans, J. (1996). Children's attitudes to recess and changes taking place in Australian primary schools. *Research in Education*, 56, 49-61.

Farrell, S.W., Kampert, J.B., Kohl, H.W., Barlow, C.E., Macera, C.A., Paffenbarger, R.S. Jr, Gibbon, L.W. & Blair, S.N. (1998). Influences of cardiorespiratory fitness levels and other predictors on cardiovascular disease mortality in men. *Medicine and Science in Sports and Exercise*, 30, 899-905.

Li, S., Chen, W., Srinivasan, S.R. & Berenson, G.S. (2004). Childhood blood pressure as a predictor of arterial stiffness in young adults: Bogalusa heart study. *Hypertension*, 43, 541-546.

Magill, R. (1993). *Motor Learning Concepts and Applications (4th Ed)*. Madison, WI: Brown and Benchmark.

New South Wales Department of Education (2000). Get Skilled Get Active. *Primary Educator*, 6, 26-28.

Okely, T., Booth, M. & Chey, T. (2004). Relationships between Body Composition and Fundamental Movement Skills Among Children and Adolescents. *Research Quarterly for Exercise and Sport*, 75, 238-247.

Parker, A. W. (1998). Physical activity and skeletal health in children. In K.M. Chan and L.J Micheli, (Eds.), *Sports and Children* (pp.17-38). Hong Kong: Williams and Wilkins.

Ridgers, N.D., Stratton, G., Curley, J. & White, G. (2005). Liverpool Sporting Playgrounds Project. *Education and Health*, 23, 50-52.

Shephard, R.J. (1997). Curricular physical activity and academic performance. *Pediatric Exercise Science*, 9, 113-126.

Taylor, S.R., Stratton, G., Hackett, A.F. & Lamb, L. (2003). *Liverpool SportsLinx Project 01-03*. Liverpool City Council.

Valdimarsson, O., Sigurdsson, G., Steingrimsdottir, L. & Karlsson, M. K. (2005). Physical activity in post-pubertal period is associated with maintenance of pre-pubertal high bone density - a 5-year follow-up. *Scandinavian Journal of Medicine and Sports Science*, 15, 280-286.

Van der Sluis, I. M., de Ridder, M. A. J., Boot, A. M., Krenning, E. P. & de Muinck Keizer-Scherama, S. M. P. F. (2002). Reference data for bone density and body composition measured with dual energy x-ray absorptiometry in white children and young adults. *Archives of Disease in Childhood*, 87, 341-347.

Wang, M. C., Bachrach, L. K., Van Loan, M., Hudes, M., Flegal, K. M. & Crawford, P.B. (2005). The relative contributions of lean tissue mass and fat mass to bone density in young women. *Bone*, 37, 474-481.

Liverpool 'health mates'

6th formers are to be paid to act as 'health mates' and mentor younger children in a bid to cut obesity in Liverpool.

More than 300 teenagers aged 16 to 18 will be recruited to provide advice and guidance to 11 year olds who are overweight. The aim is to get them interested in activities that burn calories such as cooking, dancing or exercise. The scheme will also help prepare 6th formers for the world of work, as they will have to meet performance targets in order to receive payment in gift and travel vouchers.

Young People's plan

The scheme is part of a massive drive to improve the health and well being of youngsters, proposed in Liverpool's Children and Young People's plan. Half of 11 year old boys and 40% of 11 year old girls in Liverpool are overweight. 1 in 20 is clinically obese and 1 in 3 do not do enough exercise.

The plan aims to cut the number of overweight or obese kids by a half in the next 3 years, and get all youngsters taking part in 2 hours of exercise per week.

Influence of peers

Councillor Paul Clein, executive member for children's services, said:- "The opinions of young people have formed the basis for this plan. They spoke and we listened. It is a fact that youngsters are far more easily influenced by their peers than by adults. We can use the admiration that they have for older teenagers and influence them in a positive way. We are committed to

working with partners in health, the police and the voluntary sector to improve life for young people, and the plan sets some challenging targets which we have to meet."

Priorities

4 key priorities have been identified as part of the Children and Young People's Plan. They are:

- ♦ Reducing childhood obesity and promoting a culture of physical activity
- ♦ Reducing the risk of abuse, bullying and anti social behaviour
- ♦ Improving the achievements of children in care, from ethnic minorities and young carers
- ♦ Improving early diagnosis and family support for disabled and special needs children

Council leader Warren Bradley said:- "Today's kids are tomorrow's adults and we must do all we can to give them the best possible start in order to prevent them facing health problems in later life. Overweight youngsters are more likely to be bullied and that can have a knock on effect on their confidence and potential to achieve at school. It is vital we break the couch potato habit and tackle the growing problem of child obesity by finding innovative ways of getting them off out of the house and taking part in physical activity. Our groundbreaking kids' gyms and games consoles on fitness equipment are already enticing youngsters into our Lifestyles leisure centres, and we will build on our success in these areas. Teaching youngsters

the importance of eating healthily and getting fit will help them develop habits that last a lifetime."

Free Lifestyles facilities

As part of the plan to reduce obesity, from 1st May 2006, 60,000 youngsters are getting free use of the city's Lifestyles facilities, including swimming and gym facilities after school, at weekends and during school holidays. The city is also pledging to create 50 new activity play areas in school, deliver healthier meals and work with food stores to help parents ensure their children eat healthily.

After school activity

The city council also wants to reduce youth nuisance by 30% through supporting the development of after school activity and providing diversionary activity at libraries and leisure centres. Improved family support and assessment procedures will bring the number of youngsters on the Child Protection Register down by 20%.

Bullying

The plan also proposes that the number of 11 to 15 year olds who are bullied is halved over the next 3 years through the training of anti bullying mentors in schools, extra training for children's services staff and maintaining the Bully Busters helpline.

This article is based on a press release and further updates from Paul Johnston, Broadcast News Officer, Liverpool City Council Newscentre.