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*Sports*Linx: Improving the Health and Fitness of Liverpool's Youth

A description of one of Europe's largest ongoing health and fitness programmes for children.

The SportsLinx project was founded in 1996 as a sports development project with an initial remit to identify talented youngsters and encourage participation in exercise at a grass-route level.

The project was established in response to the Government's "Sport - Raising the Game" document (Department of National Heritage, 1995) that emphasised the need for schools and sporting communities to work together in providing better opportunities for young people. Around the same time the Sports Council allocated funds to subsidise the cost of national governing body sports awards for teachers, as research indicated that children across the United Kingdom were choosing to participate in less physically demanding pastimes (Armstrong et al., 1991; Riddoch and Boreham, 1995; Atkins et al., 1996; 1997). Furthermore, research also showed that children were eating about 30% fewer calories than in the 1930's but were getting fatter (Durnin, 1992). Bundred et al. (2001) reported that childhood obesity and the number of children classified as being overweight is increasing throughout the UK, with a reduction in physical activity attributed as the main reason.

Contrary to popular belief, research has shown that children are not opposed to physical activity, reporting that they need more opportunities to participate (Manson, 1995). Consequently, the on-going aim of the SportsLinx programme is not only to offer a diverse range of sports and activities to young children but to also, increase levels of physical activity and promote a healthier lifestyle.

Since the pilot scheme in 1997-98, which involved 1500 children aged 9-14 years, the SportsLinx project has evolved into the largest ongoing health and fitness programme in Europe designed to monitor the health, nutritional status and fitness levels of children in Liverpool. In the last four years approximately 20,000 9-10 year olds have been involved in the project with an additional 4,000 11-12 year olds participating since 2002. The current scheme is multi-faceted by monitoring the health, nutrition and fitness status of children in Liverpool and also offers the children the opportunity to participate in sport and nutrition taster days and after school clubs. It has a talent identification and referral scheme, and provides coach education to teachers, parents and individuals within the local community (Figure 1).

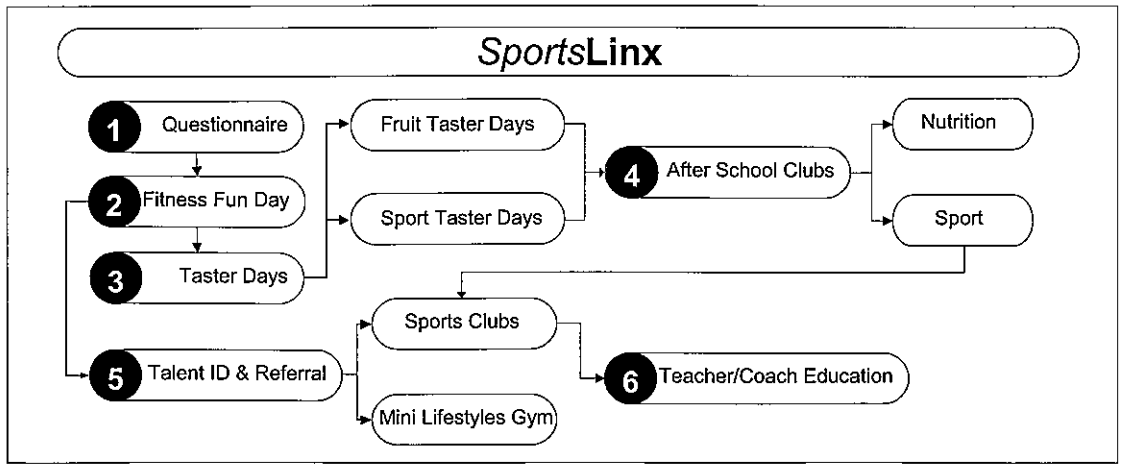

Figure 1
A schematic diagram of the *Sports*Linx Project showing stages 1-6

Liverpool is an area recognised as having high levels of social and economic deprivation, therefore providing opportunities for socially excluded individuals is a high priority for Liverpool City Council. SportsLinx has actively targeted resources into these areas so that maximum impact can be achieved. As a result, the Education Department of Liverpool City Council encourage every school to participate in the SportsLinx programme. Currently 110 primary schools, 16 secondary schools and 10 special schools are involved with the project. Following approval from the Head Teacher the schools distribute a letter to the parents of every year 5 (or year 7) children outlining the nature of the project and asking permission for their son or daughter to participate in the programme.

Stage 1 - The Questionnaire

The first stage of the programme involves the completion of a questionnaire about diet, sporting interests, and health and fitness status. The questionnaire is integrated into a Personal and Social Health Education (PSHE) or Information, Communication and Technology (ICT) lesson and discussions surrounding the questions contained in the questionnaire are prompted by the teacher. The schools are encouraged to complete the questionnaire on-line as research suggests that children are more honest when answering questions on a computer compared with paper versions of the same questionnaire (Hackett, et al., 1989).

The results from the dietary section of the questionnaire have shown that children in year 5 are more likely to eat breakfast before leaving home than children in year 7, with a greater proportion of the older children consuming breakfast on the way to school (Hackett et al., 2002). It was encouraging that fruit was the food mentioned most by the Liverpool children (69-77%), but alarming, only 31% of primary children and 21% of secondary children reported consuming both fruit and vegetables on the same day. Several less desirable foods (pre-sugared cereal, chocolate, cakes, confectionary, sausages, burgers, fried fish and full-fat milk) were reported as having been eaten by more boys than girls of primary age, a trend that was also present in older children. These results and other published papers from the SportsLinx project (Johnson and Hackett, 1997; Hackett et al., 2002) clearly indicate that the diets of children in Liverpool are dominated by undesirable foods, which are high in sugar, fat and salt. The data also suggests that diet may deteriorate with the move from primary to secondary school and highlights the importance of promoting healthy eating habits in children of primary school age. The SportsLinx programme has addressed these key issues by introducing fruit taster days and after school nutrition clubs which are discussed in more detail in a later section.

...children in year 5 are more likely to eat breakfast before leaving home than children in year 7.

Data from the SportsLinx sports preference question indicate that football (41%) was the most popular sport, followed by swimming (19%), dance (10%), and athletics (6%). These findings show different trends compared to the findings of a Sport England survey in 1999 (Sport England, 2001) and may be attributed to the regional differences in the popularity of sports. This is most clearly highlighted in the case of football, with both sexes ranking football highly in Liverpool, whereas football was ranked first (67%) and fifth (18%) by the boys and girls respectively in the Sport England survey.

Additional sports questions include do your parents/guardians play sports? If so, which sports do they play? Do you take part in a school team? If so, which? Do you take part in a sports team outside of school? If so, which? If not, why not? Health questions are also included in the questionnaire such as how do you rate your health? Have you ever smoked? What is the best way to keep a healthy lifestyle? The final section asks the child about how active they are during school breaks, how they travel to school and what time do they get up and go to bed, for example. However, space limits the results that can be presented and discussed here. After completing the questionnaire the children attend a Fitness Fun Day at their local sports centre.

Stage 2 - The Fitness Fun Day

A modified version of the Eurofit tests (Adam et al., 1988) are used to assess each child's skill related fitness and additional tests are used to examine health related fitness levels (Table 1). The tests have been used by sports scientists, physical educators, and sport development officers for a variety of different reasons (Kemper and Van Mechelen, 1996), but within the context of SportsLinx the tests are used to assess the fitness levels of children in Liverpool and to identify talented youngsters as well as those who have low fitness levels that may affect their long term health. Traditionally physical fitness has been linked with sporting performance, however health related fitness, as opposed to skill related fitness, comprises by definition those aspects of physical fitness that are related to health i.e. cardio respiratory fitness, muscular strength, endurance, body composition and flexibility.

Table 1 The fitness tests used in the *SportsLinx* project

Test	Dimension	Skill or Health Related Fitness
Height	Growth	Body measures
Weight	Growth	Body measures
Skinfold measures	Body fat	Body measures (Health)
Sit and reach	Flexibility	Health
Modified pull-ups	Muscular endurance	Health
Handgrip strength	Static strength	Health
20m shuttle run	Stamina	Health
Standing long jump	Power	Skill
10 x 5m sprint	Speed	Skill
Plate tapping	Limb speed	Skill
Speed-bounce	Muscular endurance	Skill

Overall, the results of the Fitness Fun Days show that the children of Liverpool performed well in the stamina test, although there was a large variation over the group. However, the measurements of strength and flexibility revealed poor performance, and remain areas that should be focused on, whereas the skill related tests indicated that many of the children outperformed European standards. The following section will describe the individual tests in more detail and provide a summary of the results for the children of Liverpool.

10 x 5m sprint

This test examines speed and agility. The child is required to run as quickly as possible between two lines spaced 5 m apart a total of 10 times and the time is recorded. On average the children tested in Liverpool were better than the Eurofit standards with times of 22.7 s and 23.8 s in boys and girls respectively. Speed and agility are important aspects of many sporting activities.

Plate-tapping

This test assesses upper limb speed. The child places their non-preferred hand in the centre of a table while they move their favoured hand between yellow discs as fast as possible until 25 cycles are completed; the time to complete the test is recorded. The Eurofit standards for plate-tapping are 18.1 s for boys and 17.6 s for girls. The data collected from year 5 children indicate that the Liverpool children performed substantially better than the Eurofit standards, with times of 14.9 s in boys and 14.5 s in girls. This suggests that on the whole children of Liverpool should excel in sports that require good hand-eye coordination.

Standing long jump

This test measures power of the whole body (particularly the legs). The child stands with both feet behind a line and is asked to jump as far forward as possible. The distance in metres is recorded as the best of two jumps. The SportsLinx data indicates that children in year 5 have poor leg power compared with European standards, with Liverpool boys scoring 8 cm less than Eurofit values and the girls 14 cm below the European average.

Modified pull ups

Upper body strength is measured with this test. Lying flat on the floor with hands holding a bar the child is required to pull themselves up so his/her chin touches a carefully-placed elastic band. The number of correct repetitions is recorded (unlimited time). Unfortunately no European data are available for comparison as the Eurofit test battery uses a different test to measure upper body strength. Comparisons with American data suggest that the children from Liverpool perform less well on this task, with boys achieving 7 pull-ups and the girls performing 4.6 pull-ups compared to values of 10 and 9 for American boys and girls respectively.

Sit and reach

This test measures the combined flexibility of the trunk and hips. The child sits on the floor, legs straight and feet up against the apparatus. Then with both hands they reach out as far as possible. Two attempts are permitted and the highest reading is recorded (in cm). The SportsLinx data revealed that on average the boys could reach 1cm beyond their toes, whereas the girls could reach 2.8 cm further. However 50% of the boys and a quarter of the girls failed to touch their toes. These values are well below their European counterparts and indicate that if left uncorrected many children in Liverpool could develop back and postural problems. Jones and Hitchen (2000) reported 18% of all 10 year olds and 69% of 16 year olds questioned in the North West experienced low back pain at some time. If the problem is ignored, back pain will be a significant problem for future generations.

Hand grip

This test is an indicator of overall strength. The child holds a dynamometer at arm's length above the head and squeezes as tightly as possible bringing it down to their side, using separately both the right and left hand. The highest reading of the attempts is recorded. The data indicate that Liverpool children scored below average on this test with values of 15.4 kg and 14.3 kg for the boys and girls, which are 1.7 kg and 1.1 kg less than the Eurofit standards. Although the health benefits of muscular strength are not as apparent as those of aerobic fitness, adequate strength is necessary to perform daily tasks without fatigue. In addition, muscular strength is also linked to joint flexibility and may help prevent injury.

Speed bounce

This test measures muscular endurance of the legs. The child jumps over a raised platform as many times as possible in 30 seconds and the number of times the barrier is cleared is recorded. No normative data is available for European children as this test is specific to the UK and is one of the activities included in the Sports Hall Athletics Scheme. As yet here are no UK or international standards for this test. Liverpool boys and girls performed similarly on this test, with boys completing 23.4 bounces and girls completing 23.9 bounces. Speed and agility are important in many sports, for example changing direction quickly in football, netball and basketball.

20m endurance shuttle run

This test measures stamina. The child runs to volitional exhaustion between cones spaced 20m apart in time with bleeps recorded on an audiotape. The bleeps come quicker as the test progresses. The number of shuttles completed is recorded. The results from the SportsLinx study indicate that Liverpool children were on average significantly better than the Eurofit standards, completing 47.7 (boys) and 35.5 shuttles (girls); 12.7 and 9.5 shuttles more than the Eurofit standards. However these results are deceptive, as despite the average performance of the children exceeding the European data, one quarter of all the children tested were lower than the Eurofit norms.

Anthropometric measurements

Height and weight were compared to the values from a National survey (Child Growth Foundation, 1996). The average weight of the Liverpool boys was 32.1 kg; slightly lower the national average of 32.9 kg, whereas the average weight of the Liverpool girls was 32.7 kg, lower than the national average of 34.2 kg. The average height of the Liverpool boys was 137.5 cm, which was slightly shorter than the average population at 138.6 cm. Likewise the girls, at 136.4 cm were 1.5 cm below the national average.

Skin-fold thicknesses are used as an indicator of the amount of body fat. Using the equations of Lohman (1987) the sum of the triceps and calf skinfolds were used to provide an indicator of overall body fatness. The results show that 63% of the boys and 46% of the girls had optimal body fat. However, 37% of the boys and 51% of the girls had values above the optimal level, with 11% of those boys and 20% of those girls described as

having very high levels of fatness.

Implications of the findings

Overall, these results have implications for coronary heart disease (CHD), which is one of the main causes of death in Western society. In 1999 there were over 17,000 deaths from CHD in the North West, compared with just over 12,000 deaths in the South West (Department of Health, 2000). Thirty seven percent of all deaths from CHD are solely due to inactivity and can therefore be prevented (British Heart Foundation, 2000). Inactivity is the most prevalent risk factor for CHD with 70% of women and 60% of men in the UK not active enough to achieve the health benefits from physical activity (Prescott-Clarke and Primatesta, 1988). Although the symptoms do not become apparent until adulthood there is evidence to suggest that CHD has its onset in early childhood (Paffenbarger, 1988). Over a ten year period, childhood obesity in Merseyside has risen significantly with the number of overweight and obese children increasing by 9% and 4% respectively (Bundred et al., 2001). Furthermore there is evidence to suggest that obesity is likely to persist into adulthood, with 70-80% of obese adolescents becoming obese adults (Kolata, 1986). Obesity is becoming one of the most common health problems and is considered to have reached epidemic proportions worldwide (World Health Organisation, 2003). A decrease in energy expenditure is seen as the major cause of the recent increase in obesity. Evidence from Exeter (Armstrong et al., 1991), Northern Ireland (Riddoch and Boreham, 1995) and Liverpool (Atkins et al., 1997) demonstrates that young children are choosing to participate in less active pastimes such as playing computer games and watching videos.

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Regular participation in physical activity is associated with substantial health benefits including maintenance of a healthy body weight, increased bone mass and improved psychosocial outcomes in children and adolescents (Sallis and Patrik, 2001). A causal link has been reported between the level of sports participation during childhood and physical activity levels in adulthood (Kuh and Cooper, 1992; Sports Council and Health Education Authority, 1992). Therefore establishing active lifestyles from a young age is important, as the modification of behaviours are best achieved before the behavioural patterns are fully established and resistant to change. Attitudes towards physical fitness are established in childhood and may influence future activity patterns (Blair, 1995). Consequently, SportsLinx provides children with the opportunity to try a variety of new and exciting sports that they would not necessarily be exposed to at school through taster days and after school clubs.

Stage 3 - Taster Days

A section of the SportsLinx questionnaire asks children to identify their favourite sport, the results showed that football was the most popular sport, followed by swimming, dance and athletics. Each school has a taster session designed to suit their individual needs, by including the three most popular sports requested by the children. Between September 2001 and July 2002 over 3,500 children participated in SportsLinx taster days, which included expert coaching in athletics, basketball, football, cricket, netball, rugby, tennis and volleyball.

In addition to the sports taster days, the schools are offered a fruit taster day. These sessions educate children in the importance of a healthy balanced diet by introducing them to the 'five-a-day' campaign and also encouraging them to eat fruits which they may not have tried before. Approximately 1,200 children (40 schools) have been involved in the fruit tasting sessions each year which are conducted in partnership with Liverpool Community Dieticians and the Health Action Zone 'Fruit in Schools' campaign.

Stage 4 - After School Clubs

Following the taster days the schools select their favourite activity and are given the opportunity to take part in a 6-18 week sport and/or a 6 week nutrition club based on site. From September 2001 and July 2002, 9,300 children have participated in after schools sports clubs with 55,470 attendances. The after school clubs have included athletics, basketball, cricket, cycling, dance, football, gymnastics, health and fitness, netball and rugby and are run by qualified coaches.

This year sees the full introduction of the after school nutrition clubs which aim to improve the eating habits of the children of Liverpool by promoting better nutrition and encouraging practical cooking skills. Since the introduction of the clubs, over 29 schools have already benefited from the scheme. During the sessions the children learn about the different food groups, vitamins and minerals, and about what constitutes a balanced diet through quizzes, word searches, and word games. The children then move on to prepare their own food which is taken home for members of the family to try. By introducing children to foods that they have not tried before they maybe able to educate other family members after the session and take a more active role in the shopping and preparation of food. These sessions have proved to be very popular with the children and evidence suggests that they are having a significant impact on the food choices made by children (Johnson and Cheung unpublished data) at an age where diet is known to deteriorate (Hackett et al., 2002).

Stage 5 - Talent Identification and the Referral Scheme

Initially SportsLinx was designed to identify talented youngsters. Although this is no longer the primary goal of the scheme it is still vital that talented youngsters are identified and given the opportunities to participate and excel in their chosen sport. The North West and more specifically Liverpool has a history of successfully identifying and nurturing talented youngsters such as Stephen Parry (Olympic swimmer), Emma Williams (Olympic gymnast) and Olympic athletes Steve Smith and Dianne Allahgreen.

The results from the SportsLinx fitness tests provide the basis for identifying those who show particular sporting potential. The top 5% tested are fast-tracked to sports clubs to receive specialist coaching. In 2002 this involved 180 children.

In addition to those whose show sporting potential, the programme also provides opportunities for those who scored below average in the fitness tests. The bottom 5% of children tested are encouraged to participate in health and fitness activities. The sport or activity is tailored to suit individual needs, offering many of the mainstream sports. Furthermore, Liverpool is one of the first local authorities to offer a mini-lifestyles gym. The child-sized gym equipment (SHOKK®) stand along side regular gym equipment and offers families the opportunity to participate in exercise as a family unit. The children are given free membership to the gym and Mersey Travel provides free bus passes for all those involved.

Stage 6 - Coach Education

The final stage of the project involves the education of personnel to continue the work of the SportsLinx staff once they have completed their part of the programme. This ownership is vital for the continued success and the sustainability of the project. In 2002, one hundred and fifty teachers, 80 students, 97 people from the local community, 45 youth leaders, and 18 lunch-time supervisors achieved a level 1 governing body award or attended an in-house training course. Providing skilled coaches guarantees the quality of the coaching and ensures that a much wider spectrum of sports is delivered to the children both inside and outside the national curriculum.

*Sports*Linx - The Future

The SportsLinx project is constantly being refined and additional schemes added to ensure that the people of Liverpool are given the best opportunities to lead a healthy and active lifestyle. The dynamic nature of the SportsLinx project is the critical factor that sets it apart from rival schemes and which is a factor in its continued success.

Future developments are likely to include the tracking of the year 5 cohort into year 7, and possibly year 9, to assess the changing fitness levels, physical activity levels, and attitudes towards sport and physical activity. In addition, both the talented youngsters and those who performed below average in the fitness tests will be monitored to assess the effectiveness of the intervention strategies. It is also envisaged that the after school clubs will be handed over to the School Sports Co-ordinators (in the secondary schools), who will run after school clubs for their satellite primary schools ensuring the sustainability of the clubs. Ultimately, only time will tell how effective the SportsLinx project has been, huge numbers have been engaged in the scheme and almost all say it has been enjoyable. All the evidence so far indicates that future generations will be more healthy and active individuals.

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